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By

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Psychological Monographs: General and Applied

Scientists and Nonscientists in a Group of 800 Gifted Men¹Lewis M. Terman²

Stanford University

I. SOURCES OF DATA USED

THE subjects in this study were the approximately 800 male members of a gifted group who were selected in childhood on the basis of an intelligence test and whose careers have been followed for 30 years. As children all had made intelligence scores that rated them in the top 1 per cent for their respective ages. Four field studies of the group have been made: (a) at the time most of them were selected in 1921-22; (b) in 1927-28; (c) in 1939-40; and (d) in 1950-51 (9, 3, 10). On each of these occasions field assistants administered a variety of tests in addition to tests of intelligence, and collected extensive case history informa-

tion from the subjects and from their parents and teachers. Apart from the field studies the group has been followed up from time to time by sending a General Information Blank to be filled out by each subject and a Home Information Blank to be filled out by a parent or other relative. By these means almost continuous contact has been maintained with all but a few of the subjects, including slightly more than 800 males and 600 females. Of the entire group (both sexes) only some 30 subjects have been lost track of. The 800 males here reported upon do not include any who were deceased before 1940.

As this group is the only one of its

¹This investigation was carried out under Project NR 150-147 and supported by Contract Nonr 225 (03) between Stanford University and the Office of Naval Research. Funds for the publication of this report were provided by Contract N6 onr 25125. Appreciation is expressed to the cognizant ONR Scientific Officer, Dr. D. D. Smith, Head, Personnel and Training Branch, Psychological Sciences Division. Permission is granted to the United States Government for reproduction, translation, publication, use, and disposal of this article in whole or in part.

²The original data on which this study is based were obtained in a 30-year study of gifted subjects that was financed by grants from the Carnegie Corporation, the Commonwealth Fund, the Columbia Foundation, the Marsden Foundation, the National Research Council, the Rockefeller Foundation, Stanford University, and gifts from private individuals.

For help in preparing the report I am deeply indebted to my Research Associates Olga McNemar and Melita H. Oden, who directed the work of getting together the case history material on several hundred items of information about the subjects, preparing the data for treatment by electrical tabulating equipment,

and carrying out the statistical analysis. In this they were ably assisted by Wesley Becker, Maxine Bruhns, Shiela Buckholtz, Gloria Carey, and Babette Doyle. Professor Quinn McNemar gave valuable advice in planning the research and suggesting methods of analyzing the results. Professor Donald Taylor was helpful in a number of ways throughout the study. For any failures to make the best possible use of the data available and for errors that may be found in the interpretation of results, I alone must take the blame.

The present research would not have been possible but for the competent and devoted service rendered by the many persons who have assisted me in one capacity or another at various stages of my study and follow-up of gifted subjects. Outstanding among these are the following, with periods of service as indicated: Florence Goodenough (1921-24); Helen Marshall (1921-24, 1927-28, 1939-40, and 1950-51); Melita H. Oden (1927-28 and continuously from 1936-54); Barbara Burks (1927-28); Nancy Bayley (1939-40 and 1950-51); Olga McNemar (1938-41 and 1951-52); Alice Leahy Shea (1927-28 and 1951-52); Ellen B. Sullivan (1939-40 and 1950-51); and Babette Doyle (1946-54).

kind that has been studied so intensively over so long a period of time (and at a total cost of a quarter of a million dollars), it seemed desirable to sift all the data collected to 1951 in order to find what items of information might differentiate between those who became scientists and those who did not, and between various subgroups of the scientists. This search has been limited to males because only a small number of the gifted women became scientists.

II. CLASSIFICATION OF SUBJECTS

In the autumn of 1951 the educational and vocational records of all the male subjects were examined as a basis for classifying them into groups for comparative study. Dr. F. E. Terman, Dean of the School of Engineering at Stanford University, gave helpful advice on the classification of doubtful cases. The groups then decided upon were as follows:

1. Men with a considerable record of basic research in a field of physical science or engineering ($N=51$);
2. Engineers who had done research that was primarily applied rather than basic ($N=27$);
3. Engineers whose work had involved no appreciable amount of research of any kind ($N=77$);
4. Men with a record of research in a biological science or in medicine ($N=26$);
5. A medical group engaged chiefly in the practice of medicine with only incidental research or none ($N=35$);
6. A group whose undergraduate majors were in a physical or biological science but whose later careers involved little or no research in any field ($N=68$);
7. Men who as undergraduates had majored in one of the social sciences but whose later careers involved no research of importance ($N=200$);^a
8. Men whose undergraduate majors were in the various fields of the humanities ($N=127$);

^a There was also a group of 19 men who had engaged extensively in social science research, but this group has been omitted from the study because of its small size and heterogeneous make-up.

9. Men who had not attended college or had attended less than three years ($N=177$). Because of limited schooling this group was not regarded as comparable with the other groups and for this reason was omitted from the statistical evaluation of group differences.

After the case history data to 1940 had been coded and punched for IBM treatment, the cards were sorted for the first eight groups listed above and group comparisons were made by the chi-square technique on some 250 items of information. By the time this had been done, an examination of the results suggested the desirability of revising the original classification of the subjects despite the amount of recomputation this would involve. The changes made and the reasons therefore were as follows:

1. The two groups of engineers (numbered 2 and 3 in the above list) were combined into a single group. There were two reasons why this seemed desirable: (a) on most of the items of information the statistical results for the two groups agreed so closely as to indicate that they belonged together; and (b) combining them would make a sizable group of 104 subjects.
2. The second change was to combine the medical practitioners with the group that had done research in medicine or biology (groups 5 and 4 above). The reasons for this change are the same as for combining the two groups of engineers; that is, few items of information differentiated between the researchers and the medical practitioners, and combining them provided an N of 61.
3. The third change involved taking 51 lawyers who had majored in a social science out of the social science group (number 7 above) and combining these with 32 lawyers who had majored in the humanities (number 8 above), thus forming a separate group of 83 lawyers without regard to their undergraduate major. The desirability of putting lawyers in a group of their own is indicated by the fact that a good many items of information clearly differentiate them from the social science group on the one hand and from the humanities group on the other.

With these changes the groups to be compared are reduced from eight to seven. The make-up of the groups as they now stand will be described in the paragraphs that follow.

1. *Physical Science Research* ($N=51$). This group, designated PSR, is composed of men who were doing or had done basic research in any field of physical science. It includes 18 engineers, 17 chemists, 9 physicists, 3 geologists, 2 astronomers, and 1 each in mathematics and oceanography. Thirty-two of the group had taken the degree of Ph.D. or Sc.D. Other graduate degrees included E.E. or C.E., 5; M.A. or M.S., 6. Eight of the group held only a bachelor's degree, though some of these had done considerable graduate work.

2. *Engineers* ($N=104$). The E group as now constituted includes 27 men who are doing or have done applied research and 77 who are practicing engineers with no research record. Fields of engineering most frequently represented are mechanical, 25; civil, 24; chemical, 19; electrical, 14; architectural, 7; aeronautical, 5; six other fields, 10. However, several of these practicing engineers could be almost equally well classified in either of two fields. Of the total E group, 21 have one or more graduate degrees, 60 have a bachelor's degree only (though of these 6 have had one or more years of graduate work), and 23 have no degree. On the whole, group E rates far below the PSR group in scientific training and achievement.

3. *Medical-Biological* ($N=61$). The M-B group includes 26 who have done medical or biological research and 35 doctors of medicine who are engaged chiefly in medical practice. Fields of research represented by the research group include anatomy, biochemistry, fisheries, general biology, criminology, microbiology, Oriental diseases, pharmacology, physiology, psychiatry, public health, and surgery. The 35 practitioners include (according to their own designations) 12 general practitioners, 9 surgeons, 3 internists, 2 ophthalmologists, 2 psychiatrists, 2 radiologists, an anaesthetist, a gynecologist, a pediatrician, a laboratory director, and a medical director of a state-wide medical group-insurance service. Degrees held by the total M-B group of 61 are as follows: M.D., 48; Ph.D., 11; M.A. plus three years, 1; A.B. plus three years, 1. Of those who hold the M.D., one has also the D.P.H., one the M.P.H., and one the Sc.D. About half of the members of the M-B group have taught either in medical schools or in other university departments. Seven are, or have been, heads of departments.

4. *Physical or Biological Science, Nonresearch* ($N=68$). This group, designated PBS, is composed of men who as undergraduates majored in a physical or biological science but who later in many cases turned to other fields of work. Their undergraduate majors classify as follows: chemistry, 15; engineering, 14; mathematics, 10; physics, 6; forestry, 5; and 1 to 3 each in astronomy, botany, dentistry, ento-

mology, pharmacy, premedicine, and zoology. All are college graduates except 8 who had three or more years of college but took no degree. About half of the group had one to three years of graduate work. Four graduated from Annapolis and 2 from West Point. Eleven of the group are teachers of science (5 in high schools, 4 in junior colleges, and 2 in colleges). Some 30 of the others are or have been engaged in work more or less related to their science major; among these are a few who have at one time or another been employed as engineers or chemists and several who have become sales managers, superintendents, or manufacturers. However, some of the PBS group have entered vocations that make little or no use of their science training; among these are a rancher, a realtor, a jeweler, a professor of Greek who had majored in engineering, a professor of education who had majored in physics, a premedical graduate who is a lithographer, an engineer who is an investment banker, an advertising executive, and 3 chemistry majors of whom one became an accountant, one a personnel expert, and one the proprietor of an automobile agency. Another, who took a master's degree in engineering, is one of America's best-known writers of science fiction. This is one case in which the science training paid off despite a radical shift from the original goal. There is reason to believe that several members of the PBS group should never have chosen a science major.

5. *Social Scientists* ($N=149$). The SS group is composed of men who majored in one of the social sciences but have not, to any appreciable extent, engaged in research. The most frequent undergraduate majors were economics and political science, with smaller numbers in business, history, psychology, and anthropology. Fifteen of the SS group left college without taking a degree. A majority of those who graduated had one to three years of graduate work. The greatest number of graduate degrees were in business administration, with smaller numbers in economics, history, political science, psychology, education, and journalism. The group includes some 110 whose postcollege careers have been confined chiefly to business. The business fields most frequently represented are accounting, banking and investments, management (including office managers, superintendents, presidents, vice-presidents, and owners), sales and sales management, ranching, statistics, and government specialists in economics. Among those who entered other fields than business are 8 who teach in high schools or colleges, 5 journalists, 3 prominent members of the U. S. Department of State, and 3 outstanding radio writers or producers. The 20 others not engaged in business are distributed in a dozen miscellaneous occupations.

6. *Lawyers* ($N=89$). A large majority of the L group are engaged in general practice, though several have specialized in such fields as corporation law, motion picture law, petroleum law, taxation, etc. Three of the lawyers are now judges and another is a director and vice-president of a leading aircraft industry. Several members of the group have taught for a time in law schools. One has served several years as a state legislator and is now state controller. Three are employed by the federal government and three by the Army or Navy. Although most of the L group rate high in professional success, 4 or 5 are not engaged in any kind of legal work.

7. *The Humanities Group* ($N=95$). The H group is composed of men who as undergraduates majored in a field of the humanities. The majors most frequent were English, 30; philosophy, 15; languages, 14; art, 11; and music, 7. The remaining 18 majors were scattered among five different fields, including architecture, education, prelaw, journalism, and theology. Twenty of the group left college after completing the junior year. Of the 75 who graduated, 12 continued to the Ph.D. (or Th.D.), 20 to the M.A., and 5 took other professional degrees. Fourteen others completed from one to three years of graduate work without taking a graduate degree. By recent occupation the group classifies as follows: 28 educators (15 college teachers, 9 high school teachers, and 4 administrators), 23 in higher business occupations (5 public relation specialists, 4 executives in business or industry, 4 advertising executives, 3 investment and security brokers or analysts, 3 controllers or accounting executives, 2 tax analysts, 1 sales manager, and 1 insurance analyst), 7 authors or journalists, 6 clergymen, 5 in sales or clerical work, 3 motion picture or radio writers or directors, 3 librarians, 3 small business owners, 3 in skilled trades, 2 in protective service occupations, 2 artists, an Army officer, an actor, an architect, a landscape architect, and a farmer. Three are not employed because of ill health and 2 are recently deceased.

The noncollege group (hereinafter designated as NC) is composed of 177 men who did not attend college or attended less than three years. Slightly more than a third of the group (69) discontinued their schooling with high school or had less than a year of additional business or technical training; 67 had one year of college and/or additional specialized professional or technical training, and 41 had 2 years of college. Some of the latter group also had further training along special lines. By recent vocation they classify as follows: in business occupations, 50 (including 15 who are executives in business or industry; 12 in banking, finance, or insurance; 11 in accounting, auditing, statistics, cost analy-

sis, etc.; 8 in technical sales work, sales engineering, or sales management; and 4 in advertising or public relations). Thirty are in skilled trades or retail business and 16 in clerical or sales work. Ten are in the entertainment field (3 writers and producers for radio and television, 2 motion picture directors, and 5 musicians), 6 are officers in police or fire department, 4 are farmers, 4 are authors or journalists, and 4 are Army or Navy officers. The remainder are distributed among a variety of occupations with only 1 or 2 in each. Among these are a clergyman, an engineer, and a school teacher, as well as a bartender and a truck driver. Two are not employed for health reasons, and 11 are deceased, of whom 3 were war casualties.

Although the NC group was not included in the chi-square evaluation of group differences, the status of this group on most of the variables will be given for the information of readers who may be interested in comparing it with the other groups.

III. OTHERS FACTS ABOUT THE GROUPS

Table 1 gives information, by groups, on various kinds of distinction attained and on earned income; Table 2 summarizes information on publications.

Although the data in both tables are incomplete, particularly in Table 2, certain group differences are evident. As would be expected, the PSR group leads all the others in scientific achievement, and is followed by groups M-B and E in that order. The SS group would have made a better showing if the 19 who had done research in the social sciences had been merged with it instead of being excluded as too small for separate treatment, as noted earlier. Such a merger was not deemed important enough to justify the work that would have been required to punch and sort cards for the group on several hundred different variables. A few of the 19 are nationally known, one of them being among the most eminent of American psychologists in his field of research.

The PSR group includes a leading atomic scientist and one of the best known electrical engineers in America,

TABLE 1
NUMBER IN EACH GROUP WHO HAVE ATTAINED SPECIFIED DISTINCTIONS, AND
MEDIAN EARNED INCOME FOR 1949

Characteristic	PSR	E	M-B	PBS	SS	L	H	Non-coll.	SSR*	Total
1. In <i>American Men of Science</i>	28	2	14						3	47
2. In <i>Who's Who in America</i>	3	1	2		2	1	2	1	2	14
3. In a regional <i>Who's Who</i>	3	1	12	2		1	5	1	3	28
4. Elected to membership in the National Academy of Sciences	2									2
5. Has taught in a university or four-year college	13	2	23	2	2	2	15		13	74
6. Has Ph.D. or other doctorate, including M.D.	32		59	2	2	1	12		18	126
7. In 1940 rated in top 150 men for "success"	24	15	20	6	27	26	16	6	10	150
8. Median of 1949 earned income	\$7,700	6,857	13,750	6,000	7,433	9,100	5,857	5,396	6,250	

* The SSR column refers to the group of 19 men who had engaged extensively in social science research but who for reasons given elsewhere were not included in the intergroup comparisons.

both members of the National Academy of Sciences. Although no one of our science groups is at all comparable in achievement with the highly selected scientists studied by Dr. Anne Roe (4), all of whom were among the country's most eminent men in their respective fields, their total contribution to science is many times the amount that could be expected from the same number of men

picked at random in the general population.

IV. COMMENTS ON THE GROUPINGS

One serious limitation of this research is the heterogeneity of some of the individual groups, particularly groups PBS, SS, and H. The most homogeneous with respect to kind of work its members are doing is group L, though here too there are differences in years of schooling, and in degree and kind of specialization. Group PSR is homogeneous in the sense that all its members

TABLE 2
NUMBER OF KNOWN PUBLICATIONS AND PATENTS AUTHORED OR CO-AUTHORED TO 1951*

Item	PSR	E	M-B	PBS	SS	L	H	Non-coll.	SSR	Total
1. Books, nonfiction: including sciences, arts, and humanities	8	2	8	2	2	3	7	2	12	46
2. Books, fiction				10	1		10			21
3. Articles: scientific, technical, professional	307	200	725	30	20	27	58		121	1,411
4. Articles: miscellaneous	11		4	30	33	4	61	30	8	181
5. Essays, critical articles, poetry					1		47	7		55
6. Short stories, novelettes, plays	4		1	50	27	1	29	201		313
7. Patents	134	20			2					156

* Publications do not include those of editors, journalists, columnists, screen, radio, and TV writers, or cartoonists or illustrators. In addition, there have been a sizable number of scientific documents authored by the group that are secret or "restricted," the content or exact number of which we do not know.

have done basic research in physical science or engineering, but they are scattered among a variety of fields. Although the members of group E are engaged in several different kinds of engineering, there is reason to believe that in psychological characteristics the group is more homogeneous than some of the other groups. The same is probably true of the M-B group. In contrast, each of the PBS, SS, and H groups represents a wide range of occupations engaged in. Any decision with respect to the make-up of a given group from our population of gifted men involves a choice between two evils: one must either accept a considerable degree of heterogeneity or be content with a small N for the group. Whether we have sacrificed too much homogeneity for the sake of getting groups of sizable N 's is a debatable question. It is quite possible that our groupings are not the most satisfactory that could have been devised. Some may doubt the wisdom of making the field of undergraduate major a basis for the PBS, SS, and H classifications. The alternative would have been to break these into new groups according to kinds of work the men have been doing. This would have been a logical procedure but it would not have solved the dilemma of having to choose between a small N for each homogeneous group or a larger N composed of heterogeneous units. For example, a business group could have been made up from men in groups PBS, SS, and H who are engaged in any kind of business, but it would have been extremely heterogeneous as to kinds of work being done. Similarly, an educator group could have been made up from men engaged primarily in teaching or school administration, and an arts group composed of writers, actors, motion picture directors, architects, and musicians, but both of these would have been heterogeneous and the arts group would also have been small.

Another alternative would have been to classify the subjects into four groups by combining PBS, SS, L, and H in a single nonscience group for comparison with the three science groups PSR, E, and M-B. The combined group numbering 395 could be regarded as a sort of "generality" of gifted men who are not scientists. There are arguments both for and against such a classification. It is one that would have been interesting to try out to see what results it would bring; this we have not done because of insufficient funds to defray the cost of the required recomputations. Such regrouping and re-computation can still be made from data provided in Figures 1 to 54 in this report.

In all, some 500 items of information obtained for the male subjects between

1921 and 1951 were recorded on IBM cards, and on each variable the cards were sorted for the seven groups described in the preceding pages. As previously stated, the method used in assessing the over-all group differences found for a given variable was the chi-square technique. As a rule we have included in this report only the data for p 's of .05 or less, which number 108, but in a few cases we have given the data for p 's slightly above .05. In order of level of significance the 108 p 's classify as follows:

p	N
.001	52
.01	21
.02 or .03	17
.04 or .05	18

It is necessary to bear in mind the fact that differences yielding a p of .05 or even considerably lower may be due entirely to chance; at .05 the probability that they are so caused is one in twenty and at .02 it is one in fifty. It can be seen from the above distribution of our 108 p 's of .05 or less that for 73 of them $p = .001$ to .01, and that 35 are in the range of $p = .02$ to $p = .05$. Few, if any, of the 73 are likely to have been caused by chance. There is no way of knowing how many or which ones of the other 35 were due to chance, but a considerable number of them may have been so caused.

Most of the results to be presented are based on data obtained at three chronological periods: in 1921-22, in 1939-40, and in 1950-51, though some were obtained in 1927-28 and 1936-37. The material will be presented in much the same order but with a few cross comparisons of similar data obtained at different times.

Explanation of figures. The figures which follow throughout the report show graphically the trends of group differences on individual variables. In each

figure we have presented the data for two variables, the solid line always representing variable A, the broken line always representing variable B. Each line is plotted to show what percentage of each group has the characteristic in question. The N's given below the figure indicate the number of subjects in each group for whom the specified information was available. These are usually lower than the total N's of subjects classified in the various groups. In general, the information is less complete for subjects who lived too far away to be visited by a field assistant. In many cases it is incomplete because the respondent (subject, parent, teacher, or spouse) failed to answer some of the items in the questionnaires used. In the case of a few variables no attempt to include the entire gifted group was made, but only a fairly large sample of it. The percentages shown by the graphs are in each case percentages of the N's given below the figure in which the graph appears.

V. ITEMS RELATING TO CHILDHOOD AND FAMILY BACKGROUND

Nativity of parents and grandparents. The differences on both variables in Figure 1 are significant at the .01 level.

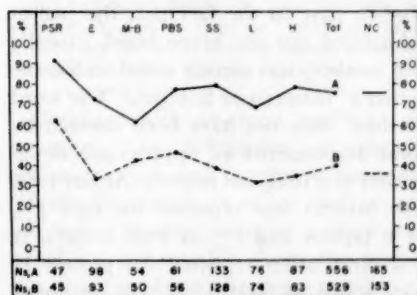


FIG. 1. Nativity of parents and grandparents: A. Both parents native-born: parent's report, 1922. B. All grandparents native-born: parent's report, 1922.

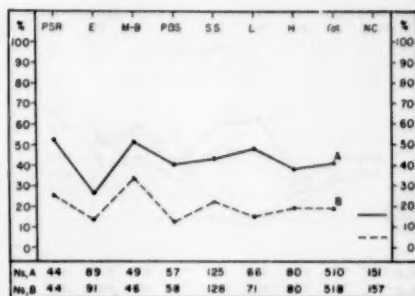


FIG. 2. Education of parents: A. Father's schooling, A.B. or higher: parent's report, 1922. B. Mother's schooling, A.B. or higher: parent's report, 1922.

Both parents are native-born in the case of 91% of the PSR group, as compared with only 61% of M-B and 68% of L. Group PSR has also by far the highest proportion of native-born grandparents—62% as compared with 31% of L and 33% of E. As would be expected, the two graphs show a certain amount of parallelism.

Education of parents. Figure 2 presents data on the education of fathers and of mothers. The differences on schooling of fathers are significant at the .02 level but those on schooling of mothers ($p=.08$) fail to pass the significance test. The proportion of fathers who have graduated from college is highest for groups PSR (52%), M-B (51%), and L (48%), and is by far the lowest for group E (26%). Although the p of .08 for mothers is well above the accepted level of significance, the data on this variable have been graphed in Figure 2 for whatever interest they may have.

Note that only 16% of the noncollege group had fathers who were college graduates, as compared with 41% of the other combined groups; the corresponding figures for mothers were 5% as compared with 19% for the combined groups.

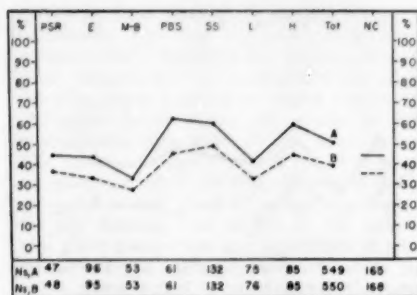


FIG. 3. Breadth of parents' interests: A. Areas of father's interests, two or more: parent's report, 1922. B. Areas of mother's interests, two or more: parent's report, 1922.

Breadth of parents' interests. The differences on breadth of parents' interests shown in Figure 3 are highly significant for the father ($p=.001$) but much less so for the mother ($p=.04$). The proportion of fathers with two or more areas of interest is highest for group PBS (61%) and almost as high for SS and H (both 59%). It is lowest for group M-B (32%) and next lowest for groups L, E, and PSR (all 41 to 43%). The SS mothers have the highest proportion with two or more areas of interest (48%) and the M-B mothers the lowest (26%). That the graphs for the two parents are markedly parallel may be due in part to the fact that it was usually one parent

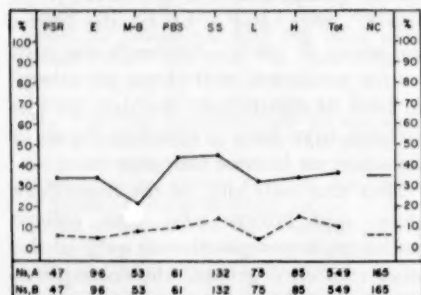


FIG. 4. Religious and outdoor interests of father: A. Father has outdoor interests or hobbies: parent's report, 1922. B. Father has religious interests or hobbies: parent's report, 1922.

(the mother) who reported on the interests of both; other factors could be marital selection and influence of one parent's interests on the other parent.

Religious and outdoor interests of father. The differences in Figure 4 on outdoor interests of father are barely significant ($p=.04$) and those on father's religious interests ($p=.06$) just fail to reach the accepted level of significance. The proportion with outdoor interests is highest for groups SS and PBS (45% and 44%), and lowest for M-B (21%). The relative rarity of religious interests attributed to these fathers is probably

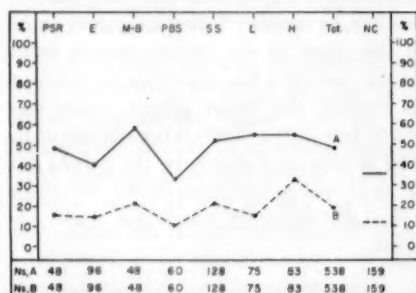


FIG. 5. Positions of honor held by father: A. Father has held one or more positions of honor: parent's report, 1922. B. Father has held one or more religious positions of honor: parent's report, 1922.

due in part to the fact that the parent who filled out the home blank (usually the mother) was merely asked to list the father's "interests or hobbies." The word "hobby" may not have been deemed by some respondents an appropriate designation of a religious interest. At any rate, this interest was reported for only 5% of E fathers and 6% of PSR fathers. It was most often reported for groups H (15%) and SS (14%). It will be noted that graph B in Figure 5 shows higher percentages of fathers who have held one or more positions of religious honor or trust.

Positions of honor held by father.

The group differences in Figure 5 on positions of honor held by father are fairly significant for number held ($p=.03$) and much more significant for holding a religious position of honor ($p=.01$). The proportion of fathers who have held any kind of position of honor or trust is highest for group M-B (58%) and lowest for PBS (33%). It is also relatively low for group E (40%). The graph on positions of honor held by father resembles considerably the graph in Figure 2 showing proportion of fathers who have graduated from college. The proportion who have held a religious position of honor or trust is highest for group H (33%) and lowest for PBS (10%).

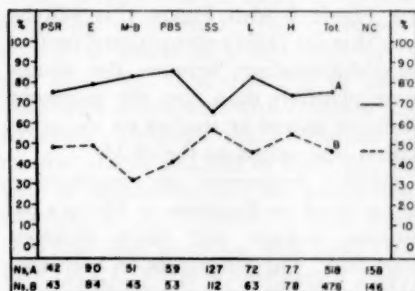


FIG. 6. Child's health in 1922 and age at weaning: A. Health rated as "good" or "very good": 1922. B. Age at weaning (breast or bottle) 13 months or older: parent's report, 1922.

Child's health in 1922 and age at weaning. The differences on child's health in 1922 and on age at weaning (Figure 6) yielded p 's of .03 and .02 respectively. Health rating of a child was based on information from the home, the school, and (in a large proportion of cases) an examination made by a pediatrician. "Good" or "very good" health was most often reported for group PBS (85%) and next most often for groups

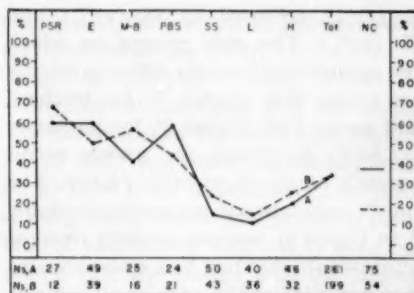


FIG. 7. Science named as a suitable vocation for the child: A. Judgment of parent, 1922. B. Judgment of teacher, 1922.

M-B and L (both 82%). The only group much below the percentage for the groups combined was SS with 65%. No reason is known for the low showing of group SS as compared with PBS. Late weaning was most frequent in groups SS and H (56% and 54%), and least frequent in M-B and L (31% and 35%). We can suggest no explanation for the difference trends on either of these variables; despite the rather low p 's, the differences could be due to chance.

Science named as a suitable vocation for the child. The graphs in Figure 7 show the proportion of parents and of teachers who named any field of science as the occupation that would probably be suitable for the child. The differences are highly significant ($p=.001$) on the judgments of both parents and teachers. The results are impressive in view of the fact that at the time the judgments were made the average age of the children was only about 10 years. On parents' judgments the highest frequencies are found for groups PSR and E (both 59%) and PBS (58%); the lowest are for groups L (10%), SS (14%), and H (20%). The highest frequency on teachers' judgments is for group PSR (67%), with M-B (56%) and E (49%) somewhat lower but also high; the lowest is for group

L (14%), followed by SS (23%) and H (25%). The only groups on which the parents and teachers differ materially are group M-B (higher % for teacher) and group PBS (higher % for parent).

Child's preference for science versus parent's rating of scientific ability. The child's occupational preference (variable A in Figure 8) was one of many items of information obtained by a questionnaire that was filled out in 1922 by all subjects who were old enough to read and write.

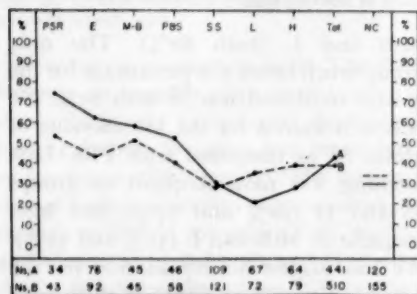


FIG. 8. Child's preference for science versus parent's rating of scientific ability: A. Child named a science as his occupational preference, 1922. B. Ability in science or nature study described by parent as above average, 1922.

Ability in science or nature study (variable B in the same figure) was one of eight fields of ability on which the parents were asked to estimate the child. The evidence given here on the latter should not be confused with the parents' judgments referred to in Figure 7.

The child's occupational preference differentiates between the groups much more reliably than does the parent's estimation of his ability in science or nature study, the respective p 's being .001 and .03. Highest on the child's choice is group PSR (74%), followed by E (62%) and M-B (58%); lowest is group L (21%), followed by H (28%) and SS (31%). The highest groups on parent's

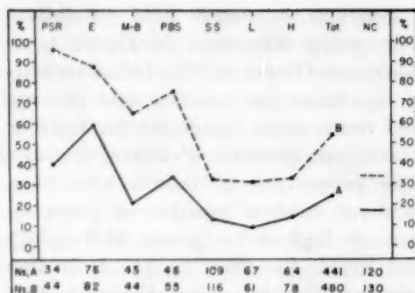


FIG. 9. Child's preference for engineering versus score on Engineer in Strong's vocational interest test taken 18 years later: A. Child named engineering as his occupational choice in 1922. B. Standard score above 35 (B) for Engineer on Strong's vocational interest test, 1940.

estimate of ability in nature study and science are groups PSR (53%) and M-B (51%); lowest is SS (28%). By comparing Figure 8 with Figure 7 it will be seen that the child's occupational preference differentiates between the groups more plausibly than does the judgment of either parent or teacher on the occupation best suited to the child.

Child's preference for engineering versus score on Engineer in Strong's vocational interest test taken eighteen years later. The differences on both variables in Figure 9 are significant beyond the .001 level. The group with the highest proportion on the child's occupational choice is E (58%), followed by PSR (38%); lowest are groups L (9%), SS (13%), and H (14%). The parallelism between the two graphs is almost perfect except for group PSR, which is higher than group E on the test but lower on the childhood preference. This parallelism is especially interesting in view of the fact that the vocational interest test was taken some 18 years after the child's occupational preference was expressed.

Childhood ability in dramatics and music. The differences on dramatic

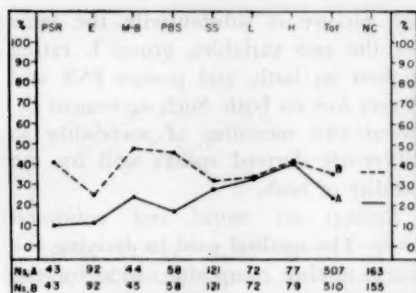


FIG. 10. Childhood ability in dramatics and music: A. Dramatic ability described as more than average: parent, 1922. B. Musical ability described as more than average: parent, 1922.

ability in Figure 10 are highly significant ($p < .001$) but those on musical ability are barely suggestive ($p = .06$). The proportion judged to have dramatic ability is highest in group H (40%) and fairly high in group L (32%); the proportion is lowest in groups PSR (9%) and E (10%). The direction of these differences agrees well with common observation. Although the differences in musical ability just fail to reach the .05 level of significance, the low proportion in group E (24%) is only a little more than half that in group M-B (47%) or PBS (45%). There is only partial agreement between parent's rating of musical

ability and the vocational interest score for Musician in Figure 26.

Age of learning to read versus information on language and literature. The differences on the variables in Figure 11 are only moderately significant with p 's of .05 and .03 respectively. The most striking thing about these graphs is their lack of parallelism. One might have expected that the groups with the largest proportion of early readers would rate high on language-literature information. Instead, the PSR group, with the largest proportion of early readers, rates by far the lowest on language-literature information. Groups PBS and SS, which are also high on early reading, are both relatively low on the other variable. We have no explanation for this negative relationship unless it is due to chance.

Test score on sociability versus ratings on social traits. The sociability score referred to in Figure 12 was based on a printed list of 90 plays and games on which the child was asked to rate each play or game (a) on his degree of liking for it and (b) on the frequency with which each was played by him. (Only the subjects who were old enough to read were given the test.) The two ratings combined provided a single "preference"

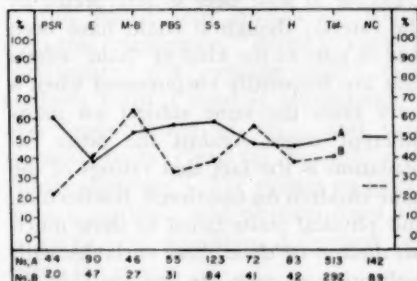


FIG. 11. Age of learning to read versus information on language and literature: A. Child learned to read before entering school: parent, 1922. B. Information quotient above 160 on a language-literature test, 1922.

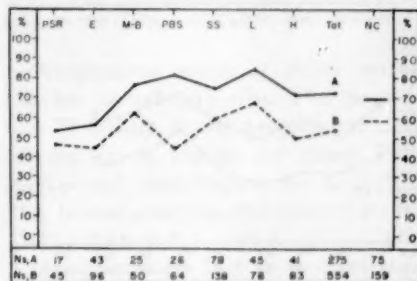


FIG. 12. Test score on sociability versus ratings on social traits: A. High sociability score based on plays and games test, 1922. B. High average rating on five social traits by parent and teacher, 1922.

score for the child on a given play or game. The sociability score of the child was based on the proportion of preferences which fell to social and competitive plays or games.

The social traits (Figure 12) on which each child was rated by parent and teacher were "leadership," "sensitivity to approval or disapproval," "popularity," "freedom from vanity," and "fondness for large groups." The cross-on-line technique was used, and the rater was asked to rate a subject in terms of the "average" child of his age and sex. For our present purpose we obtained the average of the parent's five ratings, then the average of the teacher's five, and combined these to get a single composite rating by giving equal weight to the judgments of parent and teacher.

The differences on variable A are barely significant ($p=.04$) but those on variable B (the ratings) are significant at the .01 level. One notes at once the high degree of parallelism between the two graphs. Only one marked disagreement is found: the PBS group stands high for sociability on the test but is very low on the parent-teacher ratings of five social traits. With this exception,

the picture is substantially the same for the two variables, group L rating highest on both, and groups PSR and E very low on both. Such agreement between two measures of sociability so differently derived speaks well for the validity of both.

Ratings on moral and volitional traits. The method used in deriving the parent-teacher composite rating for the ratings on moral and volitional traits referred to in Figure 13 was identical with that used for variable B in Figure 12. The moral traits rated were "conscientiousness," "truthfulness," "sympathy and tenderness," and "generosity and unselfishness." The volitional traits were "will power and perseverance," "desire to excel," "self-confidence," and "prudence and forethought."

The differences on moral traits are significant at the .03 level, those on volitional traits beyond the .01 level. The two graphs are parallel to a surprising degree, group L rating highest on both variables and PBS lowest on both. Group M-B, however, is relatively a little higher on moral than on volitional traits. The parallelism could mean that the moral traits as they were defined have much in common with the volitional traits (or at least were so interpreted by the raters), though it could have been due in part to the kind of "halo" effects that are frequently encountered when a rater rates the same subject on many different traits. Against the latter explanation is the fact that ratings of the same children on emotional, intellectual, and physical traits failed to show much parallelism of these three variables with each other or with the two variables in Figure 13.

Ratings on mechanical ingenuity and average rating on 25 traits. The composite of parent-teacher ratings was de-

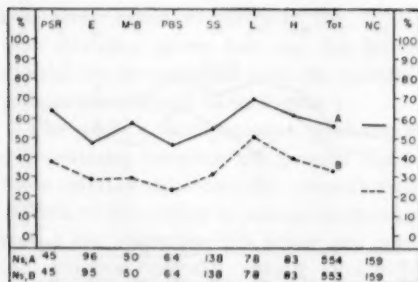


FIG. 13. Ratings on moral and volitional traits: A. High average rating on 4 moral traits by parent and teacher, 1922. B. High average rating on 4 volitional traits by parent and teacher, 1922.

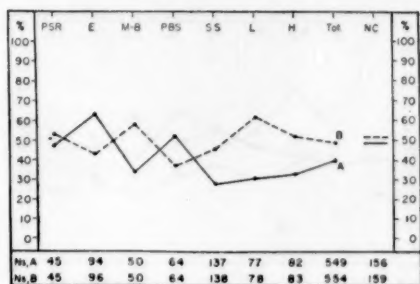


FIG. 14. Ratings on mechanical ingenuity and average rating on 25 traits: A. High rating on mechanical ingenuity by parent and teacher, 1922. B. Composite of parent and teacher ratings high on average of 25 traits, 1922.

rived for the variables of Figure 14 in the manner described in the preceding figures. The differences on mechanical ingenuity are significant beyond the .001 level. The frequency of high ratings on this variable is greatest for group E (63%) and next greatest for PBS (52%); it is lowest for groups SS (28%) and L (31%). It appears that mechanical ingenuity as interpreted by parents and teachers may be less indicative of scientific aptitude than of interest in gadgetry.

The 25 traits referred to in variable B of Figure 14 include, besides the social, moral, and volitional traits of the preceding figures and mechanical ingenuity in this figure, four intellectual traits ("general intelligence," "desire to know," "originality," and "common sense"), two aesthetic traits ("musical appreciation" and "appreciation of art"), and two physical traits ("general health" and "physical energy"). The ratings on intellectual, aesthetic, and physical traits all failed to yield significant differences between the groups.

The differences on variable B (average of the 25 traits) barely reach the .05 level of significance. Greatest frequency of high ratings is found for group

L (62%), followed closely by M-B (58%). The group standing lowest is PBS (37%). It is impossible to say what the differences on this variable mean, considering the variety of traits that were thrown together to get an average; one factor that doubtless influenced the average to some extent was the halo effect previously mentioned.

VI. CASE HISTORY INFORMATION 1928-1940

The data summarized in this section were obtained chiefly from an eight-page General Information Blank that was filled out by the subjects in 1939-1940. Data obtained at another time and from a different source will be indicated.

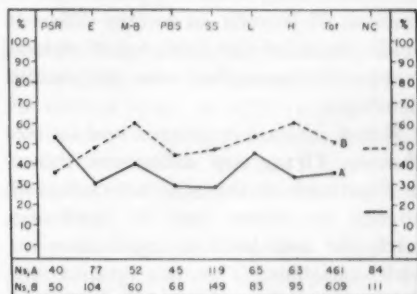


FIG. 15. Occupational status of father versus number of subject's sibs: A. Father's occupational classification, professional in 1928. B. Number of subject's sibs (living and dead), 2 or more in 1940.

Occupational status of father versus number of subject's sibs. The proportion of fathers in the professional class (Figure 15) is highest for group PSR (53%) and next highest for L (45%). The lowest groups in this respect are SS (28%), PBS (29%), and E (30%). The p of .04 indicates that these differences are barely significant. The differences on number of subject's sibs fail the test of significance ($p = .06$), but the data on this variable are given in Figure 15 for

what they may be worth. The proportion of subjects with two or more sibs is highest for M-B and L (60% each), and lowest for group PSR (36%). In other words, the group with the largest proportion of professional fathers (PSR) ranks lowest in number of sibs. The slightly negative relationship between these two variables is in line with the results of other investigations.

The low proportion of group NC whose fathers were in a profession (less than half that for the other groups combined) is one of several lines of evidence indicating the relatively inferior cultural background of this group.

The General Information Blank called for a self-rating on a five-point scale of amount of interest in twelve different fields. Seven of the fields rated yielded group differences that were statistically significant.

Rated interest in science and in mechanics. The group differences shown in Figure 16 on the 1940 self-ratings of interest in science and in mechanics reach the .001 level of significance on both variables. The two graphs are closely parallel except for their divergence on two groups: group M-B is very

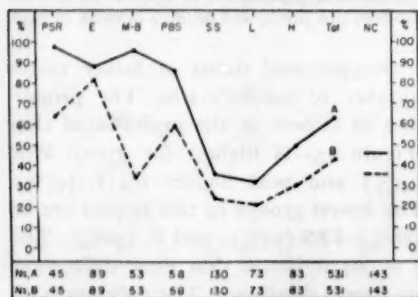


FIG. 16. Rated interest in science and in mechanics: A. Interest in science above "average" on self-rating, 1940. B. Interest in mechanics above "average" on self-rating, 1940.

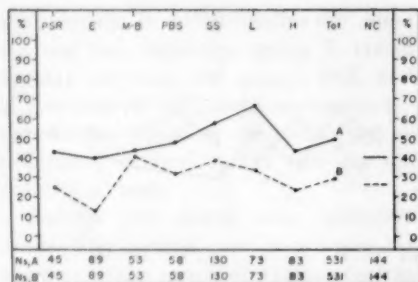


FIG. 17. Rated interest in politics and in social life: A. Interest in politics above "average" on self-rating, 1940. B. Interest in social life above "average" on self-rating, 1940.

high on interest in science but below the average of the total population on interest in mechanics, and group PSR shows a similar but smaller divergence on the two variables. On both variables the two lowest groups are SS and L, with H not far behind. The difference trends agree well with common observation; they also agree closely with the 1922 data presented in Figures 8 and 9.

Rated interest in politics and in social life. The differences found for the self-ratings on interest in politics and social life (Figure 17) yield p 's of .01 and .001 respectively. Above "average" interest in politics is by far most frequent in group L (66%), with SS ranking second (57%); it is least frequent in groups E and PSR (39% and 42% respectively). Above "average" interest in social life is most frequent in group M-B (40%), with SS ranking next (38%). It is by far the least frequent in group E (12%). The difference trends are much as one might have expected, especially those on variable A. Lawyers are notoriously interested in politics, and physical scientists and engineers (until recently, at least) little interested.

Rated interest in art and in outdoor sports. Figure 18 gives the data on self-ratings of interest in art and in outdoor

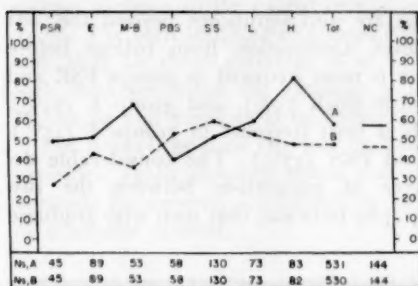


FIG. 18. Rated interest in art and in outdoor sports: A. Interest in art above "average" on self-rating, 1940. B. Interest in outdoor sports above "average" on self-rating, 1940.

sports. The differences on both variables are significant at the .001 level. Above "average" interest in art is most common in group H (82%), with M-B ranking next (68%). It is far least common in group PBS (40%), followed by groups PSR (49%) and E (51%). Interest in outdoor sports is most characteristic of group SS (60%) and least so of group PSR (27%). It is hardly surprising that men who have majored in the humanities have more interest in art than do men who have majored in the physical sciences or engineering. The group differences on interest in outdoor sports, though not implausible, might have been less easy to predict.

A seventh field of interest which yielded significant though somewhat smaller differences in the self-ratings was music ($p=.02$). Instead of graphing the data for this variable we merely give the percentages for the various groups who rated their interest in music above "average." These are as follows:

	PSR	E	M-B	PBS	SS	L	H	Total	NC
%	56	52	47	48	52	49	73	54	51
N's	45	89	53	58	130	73	82	531	144

It will be noted that on rated interest in music the one group with a percent-

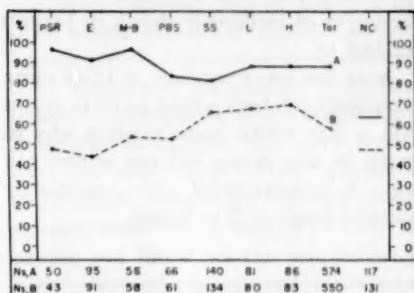


FIG. 19. Number of recommended units in high school versus participation in high school activities: A. Recommended high school units 15 or more, as reported by S in 1936. B. High school activities engaged in several to many, based on list reported by S in 1936.

age that differs radically from the percentage for the groups combined is group H, with 73% above "average" as compared with 54% for the combined group. Below 54% are five groups all within the narrow range of 47% to 52%. It is hardly surprising that men who majored in the humanities are more interested than the other groups in music as well as in art.

Number of recommended units in high school versus participation in high school activities. The differences on both variables A and B in Figure 19 are significant, the respective p 's being .02 and .01. On frequency of 15 or more recommended units the highest groups are groups PSR and M-B (both with 96%); the lowest are groups SS (81%) and PBS (83%). Participation in several to many activities is most common in groups L and H (67% and 69% respectively), and least common in groups E (43%) and

PSR (47%). The group differences on this variable probably reflect differences

in degree of sociability shown in Figures 12 and 17.

Note the low frequency of 15 or more recommended high school units in group NC, a fact which helps explain why so many in this group did not attend college. A recommended unit customarily means a grade of B or better.

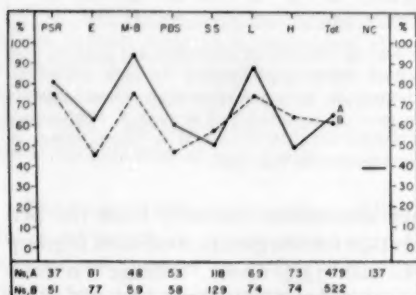


FIG. 20. Choice of present occupation and age at graduation from college: A. Occupation definitely chosen, not drifted into: report of S, 1940. B. Graduated from college before age 22: report of S, 1940.

Choice of present occupation and age at graduation from college. Few items of information on the life histories of these men differentiate the groups so clearly as the way they arrived at their occupation—whether by definite choice or by drifting. The group differences on this variable (Figure 20) are significant beyond the .001 level. As would be expected, the frequency of definite choice is highest in groups M-B and L (94% and 88% respectively), and is also high in group PSR (81%). In contrast, about half of the SS and H groups arrived at their occupation by drifting. These results are well supported by other facts in the case histories of the subjects.

It will be noted that the noncollege group also rates low on definite choice of occupation.

The differences on variable B in Figure

20 are also significant beyond the .001 level. Graduation from college before 22 is most frequent in groups PSR and M-B (each 75%), and group L (74%). It is least frequent in groups E (45%) and PBS (47%). The considerable degree of parallelism between the two graphs indicates that men who graduate

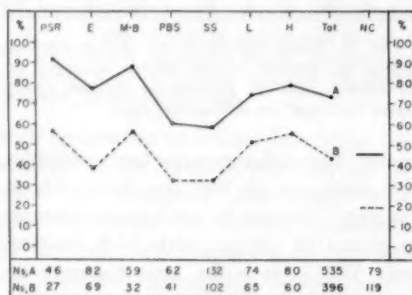


FIG. 21. College grades as related to Concept Mastery score: A. Average college grade A or B for those attending one or more years. B. Concept Mastery point score 110 or higher in 1940 test.

from college at an early age are most likely to know where they are headed vocationally.

College grades as related to Concept Mastery score. The differences shown in Figure 21 are significant at the .001 level for college grades and at the .01 level for Concept Mastery score. The frequency of high scholastic grades is greatest in group PSR (91%) and only slightly less in group M-B (88%); ranking lowest in this respect are groups SS (58%) and PBS (60%). High Concept Mastery scores are most frequent in groups PSR and M-B (both 56%), and H (55%). Ranking lowest in the test are groups PBS and SS (each having only 32% with high scores). The parallelism is to be expected in view of the fact that the Concept Mastery scores have been found to predict grade-point average of

college students to the extent of $r = .50$ to $.66$. The high standing of groups PSR and M-B on these variables is in line with data presented on variable A in Figure 19 and variable B in Figure 20.

The noncollege men rate low on both variables, again showing either lack of aptitude for superior scholarship or lack of scholastic interest.

Here three other items obtained in 1940 may be mentioned that yielded significant group differences but have not been graphed in this report. One of these had to do with the amount of self-support while doing graduate work. The proportion who earned three-fourths or more of their expenses at that stage in their schooling ranged from 37% and 41% for groups M-B and L, to 67% for both the PSR and E groups, and 71% for group H. The over-all differences yield a p of $.01$, but their meaning is blurred by the inequality of opportunity for self-support in the various fields of study and in the extent to which the courses pursued permitted time for outside work.

Another item showing statistically significant differences ($p = .02$) that were difficult to interpret was adult weight as reported by the subjects in 1940. The proportion who reported weight of 160 pounds or higher ranged from 42% and 44% for the two lowest groups (H and PSR) to 68% for group L. Perhaps the lawyers are more often heavy because their work is sedentary, and the PSR group more often light because they are more active physically. The group differences on height (proportion who were 5'11" or above) were not at all significant ($p = .20$). It is unfortunate that Sheldon's body-build indices are not available for the gifted subjects; they might have been psychologically meaningful.

Finally, mention may be made of the item which asked the subject whether he was greatly accelerated in school, and if so whether he considered it to have been an advantage or disadvantage. Only those who stated that they were accelerated and also expressed an opinion as to its effects (roughly half of each group) entered into the group N 's. The chi square was based on the proportion in each group who considered acceleration advantageous. The resulting p was barely significant at the $.04$ level. It was expected that groups M-B, L, and PSR, composed so largely of men who had taken two to four or five years of graduate work, would most often approve acceleration. As it turned out, group PSR had the highest proportion who expressed this opinion and groups M-B and L were among the lowest.

VII. SCORES ON THE STRONG VOCATIONAL INTEREST TEST

In 1939-40 Strong's vocational interest test was administered to 627 men of the gifted group, of whom 480 are members of the seven classified subgroups of the present study. The test was also administered to 130 of the NC (noncollege) group and data on these men are presented for comparative purposes. The edition of the test used was the revision published in 1938 which could be scored for 35 occupations and for three other variables. The test blanks for these men, however, were for reasons of economy scored for only 24 occupations and two other variables (Occupational Level and Masculinity-Femininity). The occupations not scored were those considered least likely to be chosen by intellectually superior men. The identity of the occupations scored is revealed in Figures 22 to 34.

The average age of the men when the

tests were given was approximately 29 years and the age range with few exceptions was from 23 to 36 years. By that time a majority of the subjects had spent from 2 or 3 to 10 or 12 years in the vocation they had entered, and the question arises as to the extent to which their scores may have been influenced by their vocational experiences. If the scores reflect such experience rather than the earlier interest patterns, the score differences among our seven classified groups would not be very meaningful. This issue has been pretty well clarified by Strong's follow-up of two Stanford University groups to determine extent to which scores on his vocational interest test change with the passing of time (5, 6). One group consisted of 285 seniors who were tested in 1927, of whom 218 were retested in 1949; the second group consisted of 306 freshmen who were tested in 1930, of whom 202 were retested in 1949. The constancy of scores over the approximately 20 years was computed separately for 115 men who had changed their vocation during the period and the 230 men who had not. For the latter group the changes in scores were very slight in all but a small percentage of cases. The score changes averaged appreciably larger for the 115 men who had changed their vocation but even among these very large score changes were relatively rare. We can assume, therefore, that the scores of our older gifted men are not very different from what they would have been had they filled out the Strong blank at the age of 18 or 20 years.

The results obtained by this test, presented in Figures 22 to 34, show that the patterns of interest revealed by the test differentiate our seven subgroups of gifted men more clearly than do most of the other variables we have investigated.

The group differences on nearly all the occupations yield p 's that are significant beyond the .001 level.

Vocational interest scores for Engineer and Chemist. The group differences for Engineer and Chemist shown in Figure 22 are significant beyond the .001 level. As was to be expected, the frequency of high scores on both variables is greatest

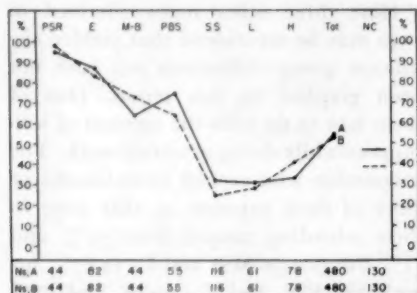


FIG. 22. Vocational interest scores for Engineer and Chemist: A. Standard score 35 (B) or higher for Engineer. B. Standard score 40 (B+) or higher for Chemist.

for groups PSR and E, and lowest for groups SS, L, and H. Groups M-B and PBS fall between these extremes. The marked parallelism of the two graphs is in line with the correlation of .88 found by Strong for scores on the two occupations in question.⁴ The proportion with B scores or higher for the occupation Engineer is 95% and 87% in the two highest groups (PSR and E), as compared with 31% to 33% in the three lowest groups (L, SS, and H). The proportion with scores of B or better for Chemist is 98% and 83% in the two highest groups, as compared with 25% and 28% in the two lowest. No other occupations show

⁴ The correlations between vocational interest scores reported in this and the following figures are from Table 193, opposite page 716 in Strong's book cited as Reference 7 in the list of references at the end of this report.

a more striking contrast between groups PSR and E on the one hand and groups SS, L, and H on the other.

Vocational interest scores for Psychologist and Physician. Figure 23 gives the data on scores for Psychologist and Physician. The differences on both yield a p of $<.001$. Again the percentage graphs are closely parallel except for the relatively higher rating of group M-B for Physician (86%) than for Psychologist (68%). Strong reports a correlation of .74 between scores on these two occupations. Many will be surprised to find that higher scores for Psychologist are more frequent in group PSR (82%) than in any other; also that it ranks next to group M-B on high scores for Physician. The high PSR rating in Psychology may be partly explained by the fact that the sample of psychologists used in establishing the norms for the occupation in the 1930's was composed largely of men trained in laboratory techniques more or less similar to those used by physical scientists. For a sample of clinical psychologists, the results would probably be quite different. The new trends in psychology suggest that a separate scale for clinical and perhaps also for social psychology ought to be developed. The low-

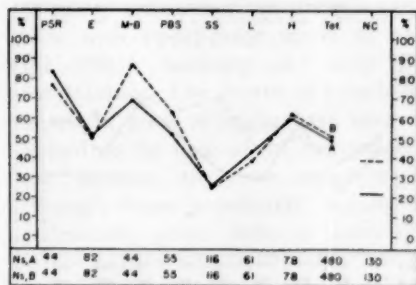


FIG. 23. Vocational interest scores for Psychologist and Physician: A. Standard score 35 (B) or higher for Psychologist. B. Standard score 35 (B) or higher for Physician.

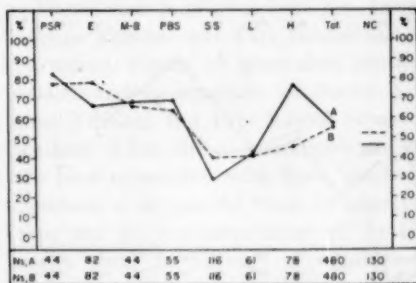


FIG. 24. Vocational interest scores for Architect and Math-Science Teacher: A. Standard score of 30 (B —) or higher for Architect. B. Standard score of 35 (B —) or higher for Math-Science Teacher.

est frequency of high scores on both variables in Figure 23 is found in group SS (25% for Psychologist and 24% for Physician). Even group E has twice as many high scores on both variables as group SS has (about 50% as compared with 25%).

Vocational interest scores for Architect and Math-Science Teacher. The lack of parallelism between the two graphs for Architect and Math-Science Teacher in Figure 24 reflects the low correlation ($r = .12$) reported by Strong for scores on these occupations. It is interesting that groups PSR and H, which contrast so greatly on many other occupations, have about the same proportion of high scores for Architect (82% in PSR and 77% in H). This is hardly surprising, since the successful architect is a combination of artist and physical scientist. The SS men, being neither artists nor physical scientists, rate lowest in this occupation, with only 29% of high scores. Group L is also relatively low, with 43% of high scores. High scores for Math-Science Teacher are most frequent in groups PSR and E (77% and 78%) and least frequent in groups SS and L (40% and 41%). The differences

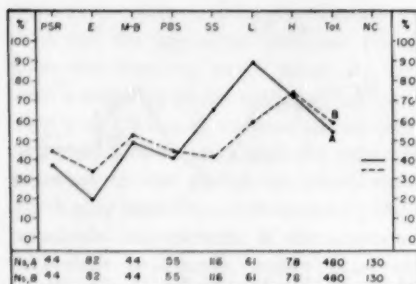


FIG. 25. Vocational interest scores for Lawyer and Author-Journalist: A. Standard score 35 (B) or higher for Lawyer. B. Standard score 35 (B) or higher for Author-Journalist.

on both variables give a p of $< .001$.

Vocational interest scores for Lawyer and Author-Journalist. Figure 25 gives the data for Lawyer and Author-Journalist. The p for each variable is $< .001$. The frequency of high scores for Lawyer is, as would be expected, greatest in group L (89%). Group H comes next with 72%. The frequency is lowest of all in group E (18%) and is moderately low in groups PSR (36%) and PBS (40%). High scores for Author-Journalist are most common in group H (74%) and least common in group E (33%). Lawyers and writers have in common a high degree of verbalism. The considerable parallelism between the graphs

is in line with Strong's correlation of .76 between scores on the two scales.

Vocational interest scores for Artist and Musician. The differences shown on both Artist and Musician in Figure 26 are significant at the .001 level. Group H tops all the others on both variables with 74% of B- scores or better for Artist and 79% of B scores or better for Musician. This was to be expected of men who had majored in the humanities. Also relatively high for Artist are groups M-B (64%) and PSR (61%). Group SS (largely made up of business men) ranks lowest for Artist, with only 21% scoring B- or better. Groups SS and L rank lowest for Musician, both having 39% with score of B or better. The correlation of .57 reported by Strong for the two scales accounts for the parallelism between the graphs. There is appreciable resemblance between the graph for vocational interest scores on Musician in Figure 26 and the graph for parent's rating of the subjects on musical ability some 18 years earlier (Figure 10).

Vocational interest scores for Minister and YMCA Secretary. Figure 27 gives the data for Minister and YMCA Secretary. Because so few of our gifted men have high interest scores on either of

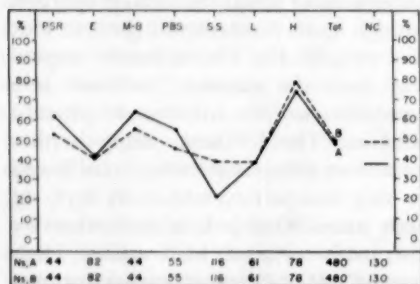


FIG. 26. Vocational interest scores for Artist and Musician: A. Standard score 30 (B-) or higher for Artist. B. Standard score 35 (B) or higher for Musician.

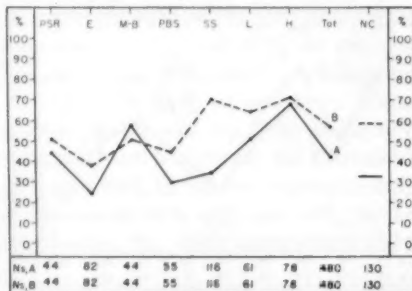


FIG. 27. Vocational interest scores for Minister and YMCA Secretary: A. Standard score 25 (C+) or higher for Minister. B. Standard score 20 (C) or higher for YMCA Secretary.

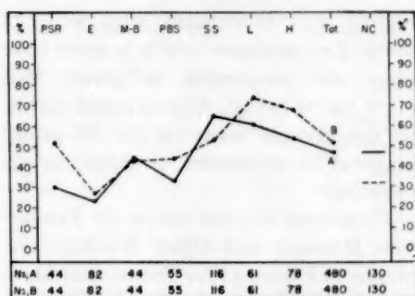


FIG. 28. Vocational interest scores for Social Science Teacher and City School Superintendent: A. Standard score 30 (B—) or higher for Social Science Teacher. B. Standard score 25 (C+) or higher for City School Superintendent.

these occupations it was necessary to set a low dividing line on each variable between upper and lower scores for computation of χ^2 and p . The p for both variables is $< .001$. Scores of C+ or higher for Minister are most frequent in group H (68%) and next most frequent in group M-B (57%). At the opposite extreme is group E (23%), followed by PBS (29%) and SS (34%). Scores of C or higher for YMCA Secretary are most frequent in groups H (71%) and SS (70%); at the opposite extreme are groups E (37%) and PBS (44%). It will be noted that group H is highest and group E lowest on both occupations. The SS group differs most on the two variables, with upper-range scores of 70% for YMCA Secretary and only 34% for Minister. The degree of parallelism is not as great as might have been expected on the basis of the correlation of .72 between the two variables for Strong's large population. Among intellectually gifted men, at least, relatively high scores on Strong's test for these two variables do not necessarily indicate that one is religious; they may indicate merely that one is interested in people.

Vocational interest scores for Social Science Teacher and City School Superintendent. Figure 28 gives data for the educational occupations of Social Science Teacher and City School Superintendent. That the two occupations we are here concerned with have much in common is supported both by observation and by the correlation of .82 between them in Strong's population of men in general; hence the parallelism shown by the graphs. Highest for Social Science Teacher is group SS with 65% of B— scores or better; group L (61%) is a close second. Lowest is E (23%), followed by PSR (30%) and PBS (33%). The two highest for City School Superintendent are groups L (74%) and H (68%); lowest again is E with only 27% of scores of C+ or better. The differences on both occupations are significant beyond the .001 level.

Vocational interest scores for Banker and Purchasing Agent. The differences shown in Figure 29 for Banker and Purchasing Agent yield a p of $< .001$ for each variable. Both occupations deal with financial matters but differ somewhat in nature, as is indicated by the moderate correlation of .59 between them in the data reported by Strong.

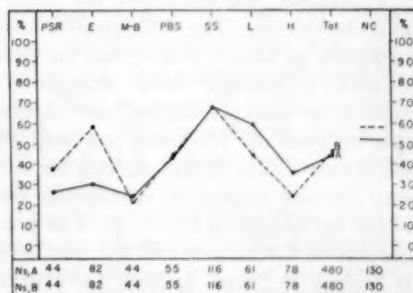


FIG. 29. Vocational interest scores for Banker and Purchasing Agent: A. Standard score 25 (C+) or higher for Banker. B. Standard score 30 (B—) or higher for Purchasing Agent.

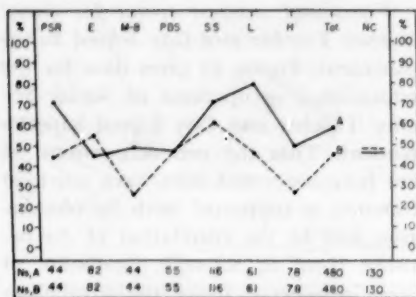


FIG. 30. Vocational interest scores for C.P.A. and Accountant: A. Standard score 30 (B—) or higher for C.P.A. B. Standard score 30 (B—) or higher for Accountant.

Highest in proportion of C+ scores or better for Banker is SS with 67%, followed by L with 59%; contending for lowest place are groups M-B with 23%, PSR with 25%, and E with 29%. Highest on Purchasing Agent is SS with 67% of B- scores or better, next is E with 57%; the two lowest are M-B with 20% and H with 24%. Group E scores relatively much higher for Purchasing Agent than it does for Banker. The work of a purchasing agent often has to do with matters related to engineering, whereas the work of a banker is more likely to involve dealing with people rather than with things.

Vocational interest scores for C.P.A. and Accountant. The differences shown in Figure 30 yield a p of $< .001$ for each variable. Although both occupations have to do with accounting, the correlation between the two scales was only .28 for Strong's data. This accounts for the very limited degree of parallelism between the graphs in Figure 30. The proportion of C.P.A. scores of B- or above is highest in group L (80%) and next highest in groups SS (71%) and PSR (70%); it is lowest in group E (44%) and nearly as low in groups PBS (47%) and M-B (48%). Group SS rates much the

highest for Accountant with 61% of scores B- or above, which is more than twice the proportion in group M-B (25%) or H (27%). As was noted earlier in this report, many of the SS group majored in economics, business, or accounting.⁵

Vocational interest scores for Production Manager and Office Worker. The graphs in Figure 31 for Production Manager and Office Worker show appreciable parallelism despite the fact that Strong found a correlation of only .25 between the two scales. Group E rates by far the highest for Production Manager with 91% of B scores or better; next highest

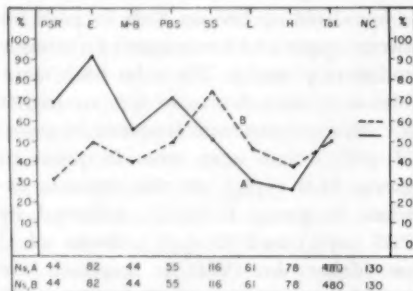


FIG. 31. Vocational interest scores for Production Manager and Office Worker: A. Standard score 35 (B) or higher for Production Manager. B. Standard score 30 (B—) or higher for Office Worker.

are groups PBS (71%) and PSR (68%). The two lowest groups on this variable are H with 26% and L with 30%. These differences are not surprising. The one high group for Office Worker is SS with 74% of scores B- or better; lowest is PSR with 30%, followed by H and M-B with 37% and 39% respectively. The p for each variable is $< .001$.

Vocational interest scores for Sales Manager and Life Insurance Salesman.

* A third scale having to do with accounting has been standardized recently. It is called Senior C.P.A. and is described in Reference 8.

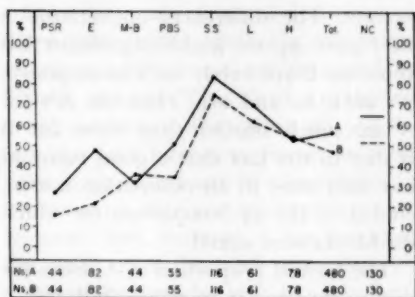


FIG. 32. Vocational interest scores for Sales Manager and Life Insurance Salesman: A. Standard score 25 (C+) or higher for Sales Manager. B. Standard score 25 (C+) or higher for Life Insurance Salesman.

The differences for the two selling occupations in Figure 32 give a p of $<.001$ for each variable. The graphs are closely parallel except for the fact that group E rates much higher for Sales Manager than for Life Insurance Salesman. Group SS rates highest on both occupations, and PSR lowest. For Sales Manager group SS has 84% of C+ scores or better and group L has 70%; in contrast, group PSR has only 27% and M-B 32%. On Life Insurance Salesman SS has 75% and L 62%; at the opposite extreme are PSR with 16% and E with 22%. Falling between the extremes on this variable are PBS with 35% and M-B with 36%. Strong reports a correlation of .82 between the two scales. It is not surprising that groups SS and L score so much higher in these occupations than group PSR. Nor is it surprising that group E scores relatively lower for Life Insurance Salesman than for Sales Manager; success in selling life insurance calls for more persuasiveness and finesse in person-to-person relationships than does the work of a sales manager, qualities in which groups E and PSR tend to rate low.

Vocational interest score for Occupa-

tional Level and for Masculinity. Figure 33 gives the data for two other variables derived from the vocational interest test: Occupational Level and Masculinity. According to Strong, a high O.L. score means that one's responses on the test tend to be unlike those made by unskilled workers and like those made by professional and upper-business groups. A high score for Masculinity signifies that one's responses tend to differ greatly from those made by women. The marked lack of parallelism between the graphs in Figure 33 reflects Strong's negative correlation of $-.41$ between the two scales. Both variables show reliable group

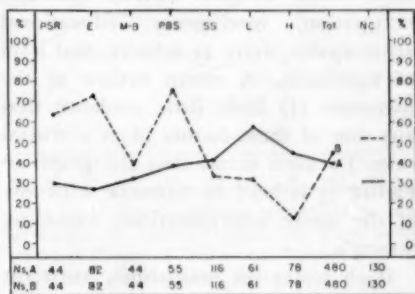


FIG. 33. Vocational interest scores for Occupational Level and for Masculinity: A. Standard score 60 or higher for Occupational Level. B. Standard score 50 or higher for Masculinity.

differences ($p = <.01$ for O.L. and $<.001$ for Masculinity). The chief contrast on O.L. is the greater frequency of high scores in group L (57%) as compared with the low scores in groups E, PSR, and M-B (all between 27% and 32%).

The low scores of these three groups, which are the most scientific of the seven compared groups, lead one to question Strong's interpretation of the O.L. score. There seems to be considerable difference of opinion in regard to the factors that enter into this score. Influences that

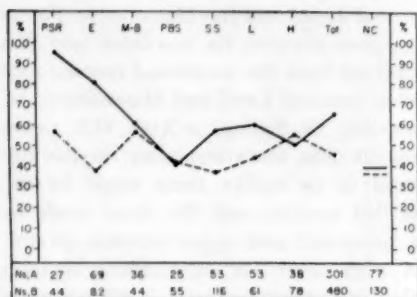


FIG. 34. High vocational interest score in own occupation versus number of A or B+ ratings: A. Standard score 45 (A) or higher in own occupation. B. Seven or more standard scores of 40 or higher (B+ or A).

have been alleged include parental occupation, intelligence, educational achievement, drive to achieve, and level of aspiration. A recent review of the literature (1) finds little evidence that any one of these factors plays a crucial role. To us it seems that the graph in Figure 33 is hard to reconcile with any of the above interpretations, including Strong's.

High scores for masculinity are most frequent in groups PBS (76%), E (73%), and PSR (64%); they are least frequent in group H (12%) and only moderately frequent in groups L (31%) and SS (33%). The group differences here found in Masculinity agree well with those found by Terman and Miles on their M-F test (11). On the latter scale the occupational groups that rated most masculine were engineers and architects, and those rating least masculine were journalists, clergymen, and artists. The high masculine rating of group PBS on the Strong test is in line with the fact that a majority of men in this group majored in the physical sciences and only a few in the biological sciences.

High vocational interest score in own occupation versus number of A or B+

ratings. The differences on variable A in Figure 34 are highly significant but those on B are barely so. The respective p 's are $<.01$ and $.04$. That the N 's for A are much smaller than those for B is due to the fact that a good many of our men were in an occupation not included in the 24 occupations for which the blanks were scored.

The highest proportion of A scores for own occupation is in group PSR (96%) and the next highest in group E (81%); rating lowest in this respect is group PBS with 40%. These percentages can be interpreted to mean that the PSR and E groups are well placed vocationally and that many of the PBS group are not. We have elsewhere called attention to the fact that some of the men who majored in a physical or biological science and then left it for other kinds of work should probably have chosen a different major. As to the second variable, a large number of A or B+ scores suggests that one's range of interests is wide. To have 7 or more such scores out of a possible 24 is indicative of a rather extreme range. Three groups rate high on proportion with 7 or more A or B+ scores: PSR and M-B (both 57%), and H (55%); the two lowest groups are SS (37%) and E (38%).

VIII. INFORMATION OBTAINED IN 1950-51

The 1950-51 data to be summarized here were provided by the following means: (a) a four-page General Information Blank filled out by the subjects in 1950; (b) an eight-page blank on Supplementary Biographical Data filled out in 1951; (c) a four-page report by the field assistants on each subject visited; (d) intelligence tests administered by the field workers to the subjects, their spouses, and their children, 1951.

Data from the General Information Blank that yielded significant differences among our subgroups are presented in Figures 35 to 39. This blank was mailed to the subjects in the spring of 1950 before the field interviews began. In most cases it was filled out by the subject in his home or office and returned by mail. In some cases, however, it was not filled out until after the field interview.

Earned income for year 1949. Subjects were asked to report earned income separately for each calendar year from

1946 to 1949. We have here used in Figure 35 only the report for 1949. "Earned income" was defined in the Blank as salary before income tax deductions, or, if subject was self-employed, as the income less operating expenses. Income from other sources was reported separately, as was also the earned income of the subject's wife. The last two items plus the subject's earned income give the "total family income."

For the year 1949, the M-B group (composed chiefly of physicians) and 43% of Group L. Scientific research is much less adequately rewarded (dollar-wise) than is the practice of a profession like medicine or law.

Political affiliation as related to conservatism. The data on political affiliation shown in Figure 36 were obtained by the following question: "On national issues which of the political parties most

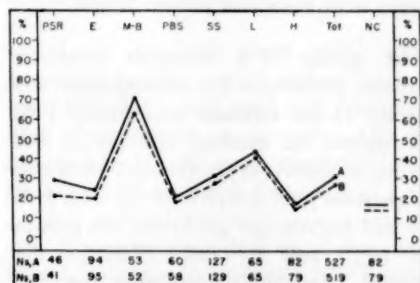


FIG. 35. Earned income for year 1949: A. Earned income \$10,000 or more: report of S, 1950. B. Total family income \$12,000 or more: report of S, 1950.

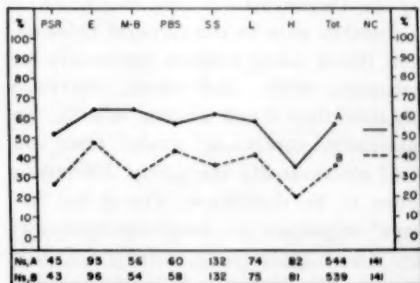


FIG. 36. Political affiliation as related to conservatism: A. Political affiliation Republican: report of S, 1950. B. Self-rating "conservative" to "extremely conservative": 1950.

1946 to 1949. We have here used in Figure 35 only the report for 1949. "Earned income" was defined in the Blank as salary before income tax deductions, or, if subject was self-employed, as the income less operating expenses. Income from other sources was reported separately, as was also the earned income of the subject's wife. The last two items plus the subject's earned income give the "total family income."

The differences on both variables are significant beyond the .001 level. Group M-B was highest on both variables and group L next highest, as was to be expected. Lowest on both was group H and next lowest on both was PBS. Group PSR, which includes our most produc-

tive scientists, has only 28% who reported an earned income of \$10,000 or more, as compared with 70% of the M-B group (composed chiefly of physicians) and 43% of Group L. Scientific research is much less adequately rewarded (dollar-wise) than is the practice of a profession like medicine or law.

The differences on both variables are highly significant ($p = < .01$ for each). Compared with the proportion for the combined groups there is a slight excess of Republicans in groups E and M-B (both 64%) and in SS (62%). At the opposite extreme is group H with only 35%. The proportion who rate themselves as conservative is highest in group

E (47%) and fairly high in groups PBS (43%) and L (41%). The least conservative groups are H with 20%, PSR with 26%, and M-B with 30%. The graphs are strikingly parallel except for the M-B group, which, as compared with the percentage for the combined groups, is more often Republican but less often conservative. This divergence from the general trend is probably due to the fact that a majority of the M-B group are physicians who oppose the type of socialized medicine favored in recent years by the Democrats.

Another item in the General Information Blank asked subjects (separately for national, state, and local elections) whether they voted always, usually, occasionally, rarely, or never. Only on local elections did the group differences prove to be significant. The p for "always" responses on local elections was .02. The highest proportion giving this response was in group L (59%) and the lowest proportion in group PSR (24%). The proportion in the other groups ranged from 44% to 54%.⁶

Avocational interests: outdoor life and photography. The data summarized in Figures 37 and 38 were obtained by asking the subject to list his "avocational interests or hobbies of recent years" and to "underscore each activity once to show moderate interest, twice to show very great interest."

The differences shown in Figure 37 have a p of .01 for outdoor life and of .001 for photography. The graphs show that outdoor life and photography are correlated interests, since they are almost equally popular in all the groups except

⁶The reader will be interested to know that 80% of men in the seven groups combined say that they always vote in national elections. This is far above the proportion of persons eligible to vote who cast their ballots in most of our national elections.

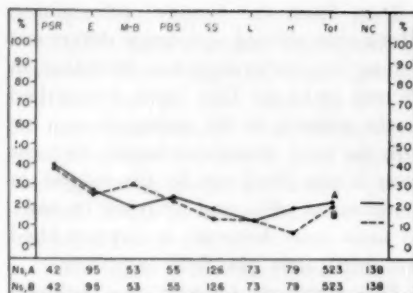


FIG. 37. Avocational interests: outdoor life and photography: A. Mentions outdoor life as an avocational interest: S, 1950. B. Mentions photography as an avocational interest: S, 1950.

two; group M-B expresses relatively greater preference for photography and group H for outdoor life. Group PSR is highest on outdoor life (40%) and group L lowest (12%). Group PSR is also highest on photography (38%), with M-B second highest (30%); lowest are groups H (6%) and L (12%). Perhaps the crucial factor in determining the percentages for photography is degree of interest in science and gadgetry.

Avocational interests: active sports and music. The differences in Figure 38 on active sports are highly significant ($p = .001$) but those on music barely so ($p = .04$). On active sports groups SS

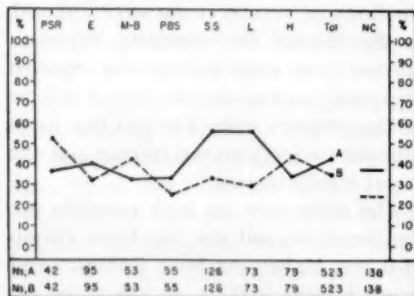


FIG. 38. Avocational interests: active sports and music: A. Mentions active sports as an avocational interest: S, 1950. B. Mentions music as an avocational interest: S, 1950.

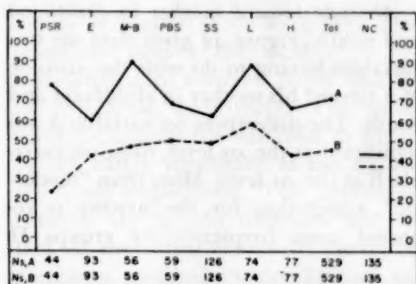


FIG. 39. Club memberships and service activities: A. Belongs to two or more clubs or organizations; S, 1950. B. Engages in one or more service activities; S, 1950.

and L tie for high place (56%) and groups M-B, PBS, and H almost tie for low place (32%, 33%, and 34%). Group PSR is highest on music (52%) and is followed by H with 44%; much the lowest on music is group PBS (25%).

Club memberships and service activities. Figure 39 gives data on club memberships and service activities. The differences on both variables are significant with p of .001 and .02 respectively. It is not surprising that the highly professionalized M-B and L groups most often belong to two or more clubs or organizations (89% and 88%), or that group E is lowest with 59%. It was not foreseen, however, that group SS would rate almost as low on club memberships (62%) as group E. The service activities entering into the second variable usually had to do with community affairs, and here the great contrast is between group L (58%) and group PSR (23%). Group E, which was the lowest on club memberships, is close to the percentage for the combined groups on service activities, perhaps because their help is likely to be sought by municipal and other authorities in connection with engineering projects.

It will be noted that the noncollege

group is well below all the others in club memberships.

Occupational status of wife's father versus her Concept Mastery score. The group differences shown in Figure 40 are barely significant at the .04 level for each variable. The lawyers most often report a superior occupational status for the wife's father (75%) and the engineers least often (48%). The percentages for the other groups on this variable are close to the percentage for the combined

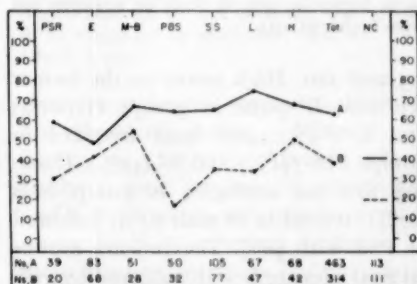


FIG. 40. Occupational status of wife's father versus her Concept Mastery score: A. Wife's father in a professional, semiprofessional, or managerial group; S, 1950. B. Wife's score on Concept Mastery test 110 points or higher; test of 1951.

groups. On variable B (high score of wife on the Concept Mastery test) group M-B ranks first with 54% of high scores and group H second with 50%. By far the lowest on this variable is group PBS with only 16% of wives who scored high. It is evident from the graphs that there is little correlation between the two variables.

On both variables the noncollege group makes a relatively poor showing, as might have been expected.

Subscores of subjects on Concept Mastery test. The differences shown in Figure 41 for the synonym-antonym test are much less significant than for the analogies test, the respective p 's being

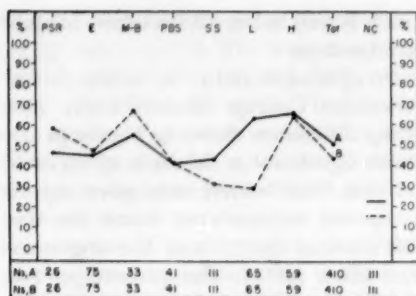


FIG. 41. Subscores of subjects on Concept Mastery test: A. Score on synonym-antonym test 90 or higher in 1951. B. Score on analogies test 60 or higher in 1951.

.03 and .001. High scores on the former are most frequent in groups H (66%) and L (63%); and least frequent in groups PBS (41%) and SS (43%). Ranking first on analogies is group M-B (67%); second is H with 64%, followed by PSR with 58%. The two low groups on analogies are L with 29% and SS with 31%. Both of these subtests are verbal in nature but the synonym-antonym test is more verbal than the analogies test, which involves perception of relationships. As lawyers are notorious verbalizers, their high rank on the synonym-antonym test was not surprising; that they would rank lowest on analogies was not foreseen.

Note the poor showing of the non-college group on both parts of the test. It will be recalled that the NC group had much less schooling than the other groups and made lower school grades.

The facts presented in Figures 42 to 54 were obtained from the eight-page blank entitled "Supplementary Biographical Data," which was filled out by the subjects in 1951. At that time the average age of the subjects was approximately 41 years.

Attitude toward mother in childhood and youth. Figure 42 gives data on two variables having to do with the attitude of S toward his mother in childhood and youth. The differences on variable A are significant at the .03 level, those on variable B at the .01 level. More than "moderate" admiration for the mother is reported most frequently by groups H

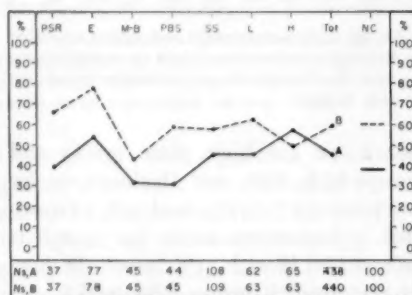


FIG. 42. Attitude toward mother in childhood and youth: A. Admiration for mother rated as more than "moderate"; S, 1951. B. Rebelliousness toward mother rated as "slight" or "none"; S, 1951.

(57%) and E (53%) and least frequently by groups PBS (30%) and M-B (31%). Little or no rebelliousness toward the mother is reported most frequently by group E (77%) and least frequently by group M-B (42%). Some parallelism between the graphs was to be expected, since admiration for the mother would naturally tend to be correlated with lack of rebelliousness toward her.

In the same blank the mother was rated on the extent to which she resisted the subject's efforts to attain normal independence. Though the group differences on this rating were not quite significant ($p = .06$), it is interesting that the groups that most often reported little or no resistance were E and PSR (in that order) and that these are the two groups

shown in Figure 42 to have been least rebellious toward the mother.

Relationships between father and son in childhood and youth. The differences yielded by the variables in Figure 43 are barely significant at the .05 and .04 levels respectively. The parallelism between the graphs indicates that the lack of oversolicitousness in the father correlates positively with affection and

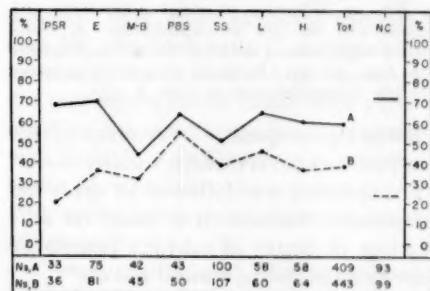


FIG. 43. Relationships between father and son in childhood and youth: A. Father was only "slightly" or "not at all" oversolicitous toward son: S, 1951. B. More than "moderate" affection and understanding between father and son: S, 1951.

understanding between father and son. The only marked discrepancy between the two graphs is shown by groups PSR and E, both of which have relatively higher percentages on variable A than on variable B. Highest on variable A is group E with 69%, followed by PSR with 67%; lowest is M-B with 43%. Highest on variable B is PBS with 54%, and lowest is PSR with only 19%. Why the PSR group should report so much less affection and understanding between father and son than group PBS reports is not clear from the history of the two groups.

Sib rivalry and feeling of being "different" in childhood and youth. The differences in Figure 44 on sib

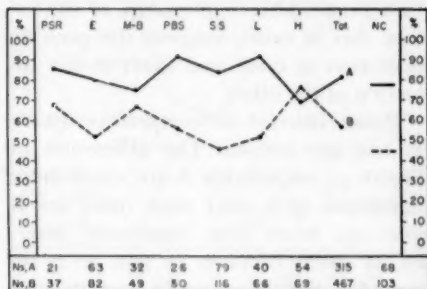


FIG. 44. Sib rivalry and feeling of being "different" in childhood and youth: A. No marked rivalry with sib or sibs of either sex: S, 1951. B. In childhood or youth felt "different" from others: S, 1951.

rivalry are barely significant ($p = .05$) but those on feeling "different" are highly so ($p = .001$). Absence of sib rivalry is most frequent in groups PBS and L (both 92%), and least frequent in group H (69%). Feeling "different" is most frequent in group H (77%), fairly frequent in groups PSR (68%) and M-B (67%), and least frequent in group SS (46%). On the whole it appears that absence of sib rivalry is negatively correlated with the feeling of being "different"; that is, absence of sib rivalry is associated with less tendency to feel

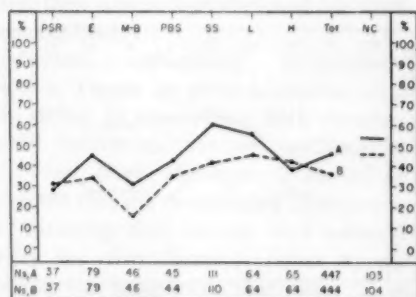


FIG. 45. Rated interest in competitive sports at two age periods: A. Interest between 12 and 20 rated as more than "moderate": S, 1951. B. Interest before 12 rated as more than "moderate": S, 1951.

"different." This relationship, to the extent that it exists, suggests the possible operation of cause and effect in one direction or the other.

Rated interest in competitive sports at two age periods. The differences in Figure 45 on variable A are much more significant ($p = .001$) than those on B ($p = .03$). More than "moderate" interest in sports between 12 and 20 is reported by 60% of group SS, as contrasted with only 27% of group PSR and 30% of M-B. More than "moderate" interest before age 12 is most frequent in group L (45%) and least frequent in group M-B (15%), a ratio of 3 to 1. One would like to know whether the relatively low interest in sports reported by the M-B and PSR groups for both age periods are characteristic of physical and biological scientists generally.

Self-rating in 1951 on early social adjustment. Figure 46 gives information on two aspects of early social adjustment. The data on variable A were obtained by responses to the following question: "In childhood or adolescence how easy was it for you to enter into the social and other activities of your classmates? (check) Had difficulty in making friends

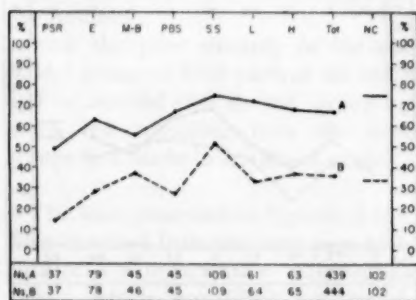


FIG. 46. Self-rating in 1951 on early social adjustment: A. Social adjustment in childhood or adolescence "average" or above; S, 1951. B. More than moderate interest in social success at age 12-20; S, 1951.

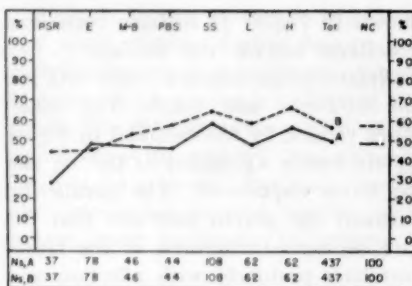


FIG. 47. Influence of social adjustment and personality on life accomplishment: A. Good social adjustment a factor in life accomplishment to date; S, 1951. B. Good personality a factor in life accomplishment to date; S, 1951.

and being accepted —; Average in this respect —; Very adept socially —." The question was followed by space for comments. Variable B is based on self-ratings of degree of subject's interest at age 12-20 in "being a social success."

The differences on variable A are barely significant at the .05 level but those on variable B yield a p of .001. Although both variables have to do with social adjustment they are by no means identical, as is indicated by the very moderate parallelism between the graphs. The graphs do agree, however, in showing highest percentage for group SS and lowest for PSR. The graphs disagree markedly on the relative status of group PBS and to a lesser extent on groups M-B and L. Neither agrees very closely with the data presented in Figure 12 on sociability as measured by the plays and games test or on composite of parent-teacher ratings of five social traits. However, both variables in both figures agree in assigning lowest rank to group PSR.

Influence of social adjustment and personality on life accomplishment. Figure 47 gives additional information on social adjustment and personality. The differences are barely significant at

the .05 and .04 levels respectively. The highest percentages on both variables are for groups SS and H. The lowest on both variables is group PSR, though on personality groups PSR and E are almost equally low. The percentage for group PBS is relatively somewhat higher on personality than on social adjustment. The marked parallelism found between the graphs suggests that the terms "good social adjustment" and "good personality" have much the same connotation for these subjects. It is especially interesting that variable A in Figure 47 not only agrees rather closely with variable B in the same figure but also agrees with variable A in Figure 46 in showing group SS at or near the top and group PSR at the bottom with respect to social adjustment.

Choice of life work. Figure 48 presents data on two variables relating to occupational choice. The differences on both are highly significant ($p = .001$ and .01 respectively). Fulfillment of the first serious choice was most often reported by the three science groups, PSR, E, and M-B, the percentages being 91, 86, and 87 respectively. Fulfillment is least often reported by groups SS and H (49% and 55%). The occurrence before age 16 of

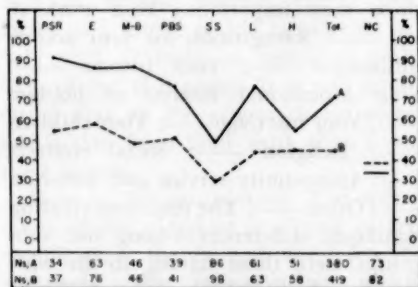


FIG. 48. Choice of life work: A. First serious choice of life work was fulfilled: S, 1951. B. First serious consideration of life work occurred before 16: S, 1951.

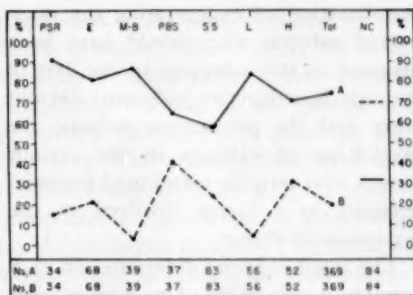


FIG. 49. Factors influencing occupational choice: A. Interest and aptitude chief factor. B. Financial necessity a factor.

the first serious consideration of choice is most frequently reported by groups PSR and E (54% and 58% respectively) and least frequently by group SS (29%). It is interesting that the PBS men, who majored in a physical or biological science and in many cases shifted to another field, have lower percentages on both variables than the PSR and E groups. It is not surprising that the SS men are lowest on both variables, as it is a common observation that many who major in a social science do so because they do not know what they want to be.

A smaller proportion of noncollege men than of any other group report that their first serious choice of life work was fulfilled.

Factors influencing occupational choice. Figure 49 gives additional data on choice of occupation. Both variables yield differences that are significant at the .001 level. However, it should be stressed that the categorizing of responses as meaning that interest and aptitude were the *chief* factor (variable A) was based on judgments that were often highly subjective, since the subjects were not asked specifically to indicate the "chief" factor. To the extent that the subjective judgments on variable A were erroneous the error may have been in

the direction of exaggerating the number of subjects who should have been assigned to this category. In the case of variable B, subjective judgment did not enter and the percentages indicate the proportion of subjects in the various groups who actually mentioned financial necessity as a factor involved in the occupational choice.

The trend of group differences on each variable is plausible. On interest and aptitude the highest percentages are for the science groups PSR, M-B, and for L, followed by group E, and the lowest are for groups SS and PBS. The most extreme of these differences are highly reliable. On financial necessity as a factor by far the highest proportion is for group PBS (41%), with group H (31%) as second highest. The groups least influenced by this factor are M-B (3%) and L (5%).

Influence of parents on occupational choice. Figure 50 has to do with possible influence of parents on the occupational choice. The differences on variable A are significant at the .02 level, those on B at the .001 level. Parental expression of a preference was most often reported by groups L (63%), PBS (60%), and M-B (57%); it was least often reported by groups H (31%) and PSR

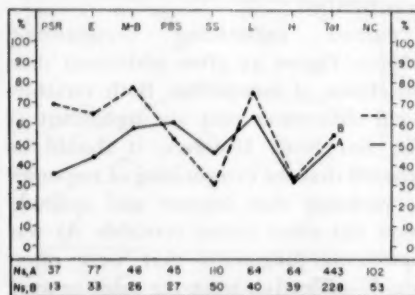


FIG. 50. Influence of parents on occupational choice: A. Parent expressed a preference regarding subject's occupation: S, 1951. B. Subject chose the occupation which parent preferred: case history.

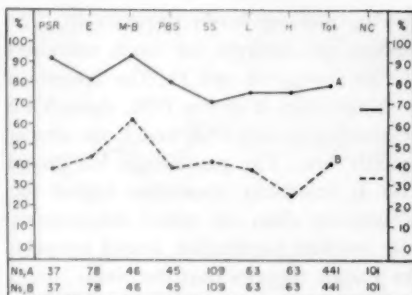


FIG. 51. Aspects of life giving greatest satisfaction: A. "Your work itself" one of the factors checked: S, 1951. B. "Your income" one of the factors checked: S, 1951.

(35%). The N's on variable B are small, because only about half of the subjects reported the parent as having expressed a preference with regard to occupational choice. The groups that most often entered the occupation for which the parent had expressed a preference were M-B (77%), L (75%), and PSR (69%); the groups that least often did so were SS (30%) and H (33%). The percentage differences on variable B agree fairly well with common observation.

One of the questions in the biography blank read as follows: From what aspects of your life do you derive the greatest satisfaction? (check once those you regard as important and double-check those most important.) Your work itself —; Recognition for your accomplishments —; Your income —; Your avocational interest or hobbies —; Your marriage —; Your children —; Religion —; Social contacts —; Community service and activities —; Other —. The responses yielding significant differences among our subgroups were those having to do with "your work itself," "your income," and "religion." The results on these variables are presented in Figures 51 and 52.

Aspects of life giving greatest satis-

faction. Both variables on life satisfactions reported in Figure 51 yield differences that are significant at the .01 level.⁷ The proportion who checked "your work itself" was highest in the PSR and M-B groups (92% and 93%) and lowest in the large SS group (70%). On the proportion that checked "income," the two contrasting groups were M-B with 61% and H with 24%. This

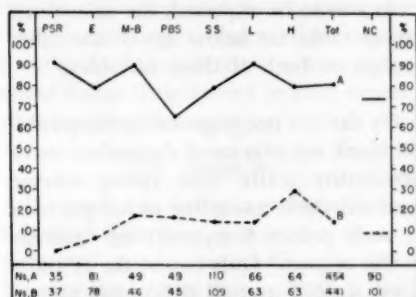


FIG. 52. More on life satisfactions: A. Says life offers satisfactory outlets for his mental capabilities: S, 1951. B. Religion checked as one source of life satisfaction: S, 1951.

contrast reflects the fact that median income is highest in the M-B group and among the lowest in the H group (see Table 1, p. 5). It is interesting, however, that group L, which was second only to M-B in median income, checks this factor as a source of life satisfaction in only 37% of cases, as compared with 61% of the M-B group. It is also interesting that all the groups derive more satisfaction from their work than from their income.

More on life satisfactions. The differences on the variables in Figure 52 are significant at the .01 and .001 levels respectively. The responses on which

⁷ When χ^2 and p were computed separately for the percentages of subjects who double-checked "your work itself" (variable A) the group differences were significant at the .001 level.

graph A is based were obtained by the direct question, "Does your life offer satisfactory outlets for your mental capabilities?" Three of the groups are practically tied for top place in frequency of "Yes" answers: PSR, M-B, and L with either 90% or 91%. The one group that is much below the percentage for the combined groups is PBS, many of whom changed their goal after college graduation. The three top groups and the low one are in line with expectations.

The responses on variable B were obtained by the question quoted on page 32 and represent the percentages who checked "religion" as one source of life satisfaction. By far the most religiously inclined of all the groups is H, with 29%. At the opposite extreme is group PSR, with not a single one who checked religion. Group E is also very low, with only 6%. It is well known that physical scientists in general are less likely than others to be religious. For the groups combined the proportion who checked "religion" as a source of life satisfaction was only 14%, as compared with 78% who checked "your work itself" and 40% who checked "income." One would like

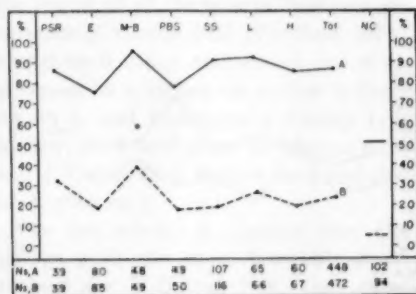


FIG. 53. Two reports on adequacy of schooling: A. Says he had had as much schooling as he wanted when he left school: S, 1951. B. Adequate education double-checked as a factor in life accomplishment: S, 1951.

to know how the generality of men would compare with this highly selected group on interest in religion.

Two reports on adequacy of schooling. Figure 53 gives data on two variables that deal with adequacy of schooling. Variable A is based on answers to the following question in the biographical blank: "Did you have as much schooling as you wanted? If not, explain." The percentages include not only "Yes" answers but also such answers as "Yes, but the wrong kind" and "Yes, but have since wished I had more." Variable B is based on responses to another item in the same blank which asked subjects to check those factors (in a list of nine given) "which have contributed to your life accomplishment to date" and to double-check "those that have been most helpful." The graph shows the percentages who double-checked the factor "adequate education."

The differences on variable A are significant at the .01 level, but those on B barely reach the .05 level. Although the items that provided these variables were differently worded, they both furnish information on adequacy of schooling and it is not surprising that the two graphs show some parallelism. Group

M-B has the highest percentage on both variables, and the two lowest groups on both are E and PBS. One disagreement between the graphs is the relatively higher percentage of group SS on variable A than on variable B; that is, most of this group had as much schooling as they wanted but relatively fewer of them double-checked "adequate education" as one of the most important factors in their life accomplishment to date.

As was to be expected, the noncollege group ranks far below any of the other groups on both of these variables.

On the last two pages of the biographical blank subjects rated themselves on 12 personality traits. The rating scheme used was the cross-on-line technique with 11 scale points, 6 representing "average in this respect." Only two of the 12 traits rated yielded over-all differences among our seven groups that were significant. These were "inferiority feelings" and "conformity to authority and convention." (The other 10 are listed in the Appendix.) The results for these two self-ratings are presented in Figure 54.

Self-ratings on conformity and on inferiority feelings. The differences on the two variables of Figure 54 are significant at the .01 and .02 levels respectively. As might have been guessed, the most conformist group is L, with 74% who rate their conformity from "average" to "extreme"; in fact it is the only group very much above the percentage for total of the groups combined. The least conformist is group E, with 41% giving such ratings. Most prone to inferiority feelings is group M-B (52%), though the proportion is also rather high in group H (44%). Inferiority feelings are least evidenced in group PBS (22%). The results on variable B were not foreseen. That group M-B, which averages

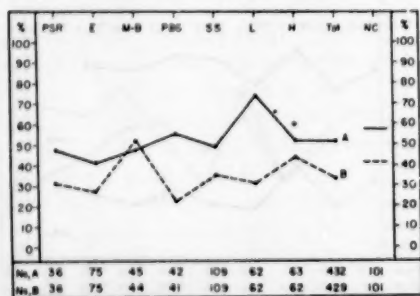


FIG. 54. Self-ratings on conformity and on inferiority feelings: A. Conformity to authority and conventions rated as "average" or more; S, 1951. B. Amount of inferiority feelings rated as more than "average"; S, 1951.

highest of all the groups in years of schooling and in earned income, should be most prone to inferiority feelings is indeed surprising; it is hardly less surprising that group PBS, many members of which chose the wrong major in college and later shifted to another field, should be at the opposite extreme. As for the proneness of the M-B group, one wonders whether some who enter medicine may not do so *because* they have inferiority feelings and want to overcome them by getting a degree that stamps them as having authoritative knowledge about things little known to most others, thus boosting their egos.

IX. SUMMARY

It remains to bring together the outstanding difference trends among our compared groups, especially differences between the science groups (PSR, E, and M-B) on the one hand and the non-science groups (SS, L, and H) on the other. The percentage graphs we have presented show at a glance that on a large proportion of the variables the first three groups contrast markedly with the last three. Percentages that tend to run high for the former are usually low for the latter, and vice versa; this despite the fact that there are some significant differences within each trio of groups. The PBS men, who as undergraduates were science majors but in a majority of cases later shifted to other fields, often show up in the graphs somewhere between the first three groups and the last three.

For purpose of summary the differences fall roughly into five categories relating respectively to (a) family background, (b) abilities evidenced, (c) vocational interest scores, (d) social adjustment, and (e) occupational success and life satisfactions. For the more important variables under each of these categories the groups

ranking very high and those ranking very low (in percentage frequencies) will be indicated. As a rule only the differences that are statistically significant will be cited.

Family background. Eight variables in this category that yielded significant differences will be noted. For convenience in referring to them they are here listed and numbered.

1. Both parents were native-born;
2. The father's education included college graduation or more;
3. The father as of 1928 was in the professional class;
4. The father's areas of interests included two or more;
5. The mother's areas of interests included two or more;
6. The father has held (as of 1922) one or more positions of honor or trust;
7. The father has held (as of 1922) a religious position of honor or trust;
8. The subject (as of 1940) had two or more sibs, living or dead.

Group PSR is highest of all the groups on variables 1, 2, and 3, and is lowest on 8. Group E is lowest on variables 2 and 5, and high on none. Group M-B is highest on variable 6, is tied for highest on variable 8, and is close to highest on 2; it is the lowest of all the groups, however, on variable 4. Group PBS is highest on 4, lowest on 6 and 7, and second lowest on 3. Group SS is highest on 5, close to highest on 4, and lowest on 3. Group L is highest on 8 and close to highest on 2 and 4. Group H is highest on 7 and tied for highest on 4.

On the whole, it appears that the groups with the most favorable background are M-B and PSR, that those with the least favorable background are E and PBS, and that groups SS, L, and H hold an intermediate position.

Abilities evidenced. Three special

abilities described by the parent as superior in 1922 yielded highly reliable group differences. Highest on "mechanical ability" was group E with a frequency roughly twice that of SS, L, or H. Nearly tied for high on "nature study and science" were groups PSR and M-B, with frequencies nearly twice that of SS. On "dramatic ability" the situation was reversed, with groups H and L highest and groups PSR and E lowest.

On the number of parents who named some field of science as a suitable occupation for the child, groups PSR, E, and PBS were almost tied for top place with frequencies several times that of SS, L, or H. On teachers who suggested a science as a suitable occupation PSR was highest and M-B next highest, with lowest positions again occupied by SS, L, and H. On the child's preference for a science as an occupation, groups PSR, E, and M-B all had frequencies two or more times as high as SS, L, or H. On the child's specific choice of engineering as the preferred occupation, group E had a frequency over four times that of SS, L, or H.

Two ability tests have yielded significant differences. On a test of information in language and literature given in 1922, high scores were about three times as frequent in groups M-B and L as in group PSR. On the Concept Mastery test given in 1940 four groups (PSR, M-B, L, and H) were almost tied for top place, and groups PBS and SS were tied for low place.

The top groups on scholastic record, both in high school and college, were PSR and M-B; lowest in high school was SS and lowest in college were PBS and SS. On graduation from college before age 22, groups PSR, M-B, and L were tied for high place and groups E and PBS for low place.

Two fields on which subjects rated their interests in 1940 were science and mechanics. On interest in science the highest groups were PSR, E, and M-B, and the lowest SS and L. On interest in mechanics the high groups were E and PSR and the lowest SS, L, and H.

The above lines of evidence are well nigh unanimous in showing that early ability or interest in science is far more common among children who later become physical scientists, engineers, or biologists than among those who enter nonscientific fields. This has long been recognized but has not yet received the attention it deserves in educational and vocational guidance.

Vocational interest scores. The Strong blanks were scored for six kinds of scientists: chemist, engineer, psychologist, physician, architect, and math-science teacher. On every one of these occupations the PSR group was either highest or second highest in frequency of superior scores, group E was highest or second highest on three, and group M-B was highest or second highest on two. At the opposite extreme group SS ranked lowest or second lowest on all six, and group L was lowest or second lowest on five. The only one of the nonscience groups that rated high on any of these six occupations was group H, which scored second highest for architect.

Consider next the eight occupations of lawyer, author-journalist, artist, musician, minister, YMCA secretary, social-science teacher, and school superintendent. Here the situation was reversed, with the science groups ranking usually among the lowest. Group E was at the bottom in seven of the eight, and PSR near the bottom in two and high in none. Group M-B ranked second highest for two of these occupations (artist and minister) but neither very high nor very

low in the others. At the other extreme, the highest or second highest rank was held by group H on six of these occupations, by group L on four, and by SS on two.

Then follow the data for eight business occupations, and on nearly all of these the three science groups ranked at or near the bottom. Exceptions were two high ranks for group E on purchasing agent and production manager. Group SS ranked highest on six of the eight business occupations and second highest on another; group L was highest on one and second highest on three. Group H, which most often ranked highest in the professional occupations discussed in the preceding paragraph, was among the lowest of all the groups on four business occupations and high on none.

Finally, on masculinity of interests the science groups ranked high and the non-science groups low. On proportion scoring A in their own occupation, groups PSR and E were highest, and PBS lowest. On proportion who scored B+ or A on seven or more occupations, groups PSR and M-B were tied for top place and groups E and PBS were lowest.

In general the results of the vocational interest tests are clearly in line with the evidence offered in the preceding section of this summary.

Social adjustment. There were some 18 variables that yielded significant group differences on matters related directly or indirectly to social adjustment. On a majority of these the nonscience groups made a better showing than the science groups. Most consistently high were groups L and SS; most consistently low were groups PSR and E. Data obtained in 1922 on four variables in this category put group L at the top on every one; these include sociality as rated by interest in plays and games, average of

composite parent-teacher ratings on five social traits, and similar parent-teacher ratings on four moral and four volitional traits. The lowest or second lowest rank on all of these four variables is held by group E, and on two of them by PSR. Only one science group ranked as high as second from the top on any of the four; this was group M-B as rated by parents and teachers on social traits.

Data on social adjustment obtained in 1940 showed a similar picture. Participation in high school activities was greatest in groups L and H, and lowest in groups E and PSR. The self-rating on interest in politics showed group L highest and group E lowest. The self-rating on interest in social life showed groups SS and M-B almost equally high and group E again lowest. Also throwing light on social traits are the vocational interest scores on such "uplift" occupations as those of minister, YMCA secretary, social-science teacher, school superintendent, and life insurance salesman. On all but one of these occupations both the highest and next to highest ranks were held by groups SS, L, and H. The exception was group M-B which ranked second highest on score for minister. Group E was lowest or second lowest on all five of these occupations, and group PSR was lowest or second lowest on two of them.

The biographical blank filled out by subjects in 1951 furnished data for ten variables that yielded significant group differences on matters related to social adjustment. These include eight ratings on the following: interest in social success at ages 12-20, interest in outdoor sports at ages 12-20, social adjustment in childhood and youth, extent to which S felt "different" from other children, admiration for mother in childhood and youth, extent of affection and understanding between son and his father, ex-

tent to which *S* has suffered from inferiority feelings, and degree to which *S* has tended to conform to authority or convention (as contrasted with tendency to rebel). Two other variables were based on the proportion of *Ss* who mentioned certain factors as having contributed to life accomplishment, the two factors that yielded significant group differences being "good social adjustment" and "good personality."

Here again the science groups tend to rate much lower than the nonscience groups. Group PSR was lowest of all the groups on six of the ten variables and second lowest on another. Group E was lowest or close to lowest on three and group M-B on four. The only high rank of a science group on any of these ten variables was that of group E, which was second on freedom from inferiority feelings. At the other extreme, group SS was highest for social adjustment on five of the ten variables and second highest on another. Group H was highest or second highest on four and group L on one. In the nonscience groups SS, L, and H, there was only a single variable on which one of these groups rated at the bottom for social adjustment; that was on feeling "different" from other children, most often reported by group H.

Occupational success and life satisfactions. There are eight variables worth noting in this category that yielded significant group differences. These concern the proportion of subjects who—

1. reported that occupation was definitely chosen, not drifted into;
2. began first consideration of their life work before age 16;
3. chose the occupation that was first seriously considered;
4. reported an earned income of \$10,000 or more in 1949;
5. checked their "work itself" as an

aspect of life giving greatest satisfaction;

6. checked their "income" as an aspect of life giving greatest satisfaction;
7. reported that life offers satisfactory outlets for their mental capabilities;
8. double-checked "adequate education" as a factor in life success.

Highest place or close to highest went to group PSR on variables 2, 3, 5, 7, and 8; to group E on 2 and 3; and to group M-B on all except number 3. In the nonscience group L was highest or second highest on 1, 4, and 7. Group SS was lowest on 1, 2, 3, and 5; group H was lowest on 4 and 6, and second lowest on 2; group PBS was lowest on 4, 7, and 8.

The above summary of group differences has been confined to the seven groups utilized in the chi-square evaluations. On most of the variables data have also been presented for the NC group of 177 men who were excluded from the chi-square computations because of limited schooling. What are some of the characteristics of this group? Our percentage graphs will enable the reader to compare it with each of the other seven groups on nearly all the variables discussed in the text. It is sufficient here to point out the individual variables which show a percentage frequency for the NC group radically divergent from the percentage frequency for the other seven groups combined. In the graphs the latter frequency is given in the column headed "Total." Table 3 shows the more significant percentage differences between the "Total" column and the "NC" column.

The facts presented in Table 3 show that, compared to the other groups combined, the NC men (as a group) were from less cultured homes, achieved less in school, as adults test lower in intelli-

TABLE 3
COMPARISON OF NONCOLLEGE GROUPS WITH THE TOTAL OF OTHER GROUPS

Item	Total	NC
	%	%
Father of S graduated from college.....	41	16
Father of S in professional class.....	35	16
Information quotient of S in language and literature 160 or higher, 1922.....	41	26
Recommended units at high school graduation 15 or more.....	88	63
Average college grade A or B (for those attending one year or more).....	65	39
Concept Mastery score of S 110 or higher in 1940.....	43	19
Concept Mastery score of wife 110 or higher in 1940.....	38	20
S a member of two or more clubs or organizations, 1950.....	71	43
In childhood and youth more than moderate affection and understanding between father and son, report of S, 1951.....	38	24
Felt "different" from others in childhood and youth, report of S, 1951.....	57	45
Earned income of \$10,000 or more for 1949.....	31	17
Occupation definitely chosen, not drifted into, report of S, 1940.....	65	39
First serious choice of life work was fulfilled, report of S, 1951.....	72	34
Checked "your work itself" as a source of life satisfaction, 1951.....	78	67
Had all the schooling he wanted at the time he left school, 1951 report.....	86	50
"Adequate education" double-checked as a source of life satisfaction, 1951 report..	23	4

gence, and are less successful vocationally. For two reasons, however, interpretation of the differences is by no means easy. In the first place, on a large majority of the hundred or so variables for which data have been presented, the NC group does not differ much, if at all, from the other groups combined. In the second place, it is impossible to say what is cause and what is effect. Are the NC men less successful vocationally chiefly because they had less education, or can the limited success in both school and vocation be accounted for largely by a general lack of ambition or drive? The latter has been a factor in many cases, and it is our opinion that educational background of the family has also played a part.

Finally, it is suggested that the reader would do well to peruse the entire list of variables (given in the appendix) which failed to yield significant differences among the other seven groups. The fact that the nondiscriminating list contains many variables which appear to resemble closely variables that yielded statistically significant differences should lend caution in the interpretation of numerical findings.

X. COMMENTS AND CONCLUSIONS

As we have stated in an earlier section of this report, the value of our search for variables that would differentiate between scientists and nonscientists, and between different kinds of scientists, has been limited by the considerable heterogeneity of several of the individual groups. A more fundamental limitation is the fact that our study of gifted subjects undertaken in 1921 was not specifically designed to throw light on the problem with which we are here concerned. Its purpose was broader and much more general, namely: (a) to select children rating in the top 1 per cent for their respective ages in "general" intelligence; (b) to discover how a population thus selected compares with unselected children of corresponding age in family background and in such traits as physique, health, school achievement, interests, social adjustment, character, and personality; and (c) to follow the subjects for as many years as possible in order to check adult achievement against the promise of childhood and youth. The population selected with these ends in view numbered more than 1,500 subjects

of both sexes and (with a few exceptions) ranged in age from 5 to 17 years.

A study and follow-up of gifted subjects for the express purpose of discovering the earlier and later correlates of achievement in science would need to differ in a number of respects from the 30-year study we have made. For one thing, it would be more economical to have, instead of a single group of subjects representing the generality of children with high IQ's, two gifted groups closely matched for superior IQ but otherwise as *unlike* as possible with respect to scientific promise. The selection of the two contrasting groups would need to be based largely on batteries of tests and ratings of special abilities and interests believed to be symptomatic of scientific talent. Group A should be composed entirely of subjects rating very high on a majority of the tests and ratings, group B of subjects rating very low on them. Preferably the age range of subjects when selected should be relatively narrow, perhaps from 8 to 12 years, and a single sex should be used to reduce the number of variables. The follow-up of two such groups would call for types of tests, interviews, questionnaires, and other procedures specially tailored to throw light on the degree of presence or absence of traits or behavior likely to be associated with scientific performances at later stages of development. A research of this kind undertaken now would have the great advantage of being able to use many techniques that did not exist 30 years ago or that existed then only in rudimentary form. Two groups, each of 300 subjects selected in the manner we have suggested and followed for a generation by the best techniques now available, would contribute far more to the prediction of scientific achievement than would a much larger miscellaneous

group selected only for high IQ and followed up by the kinds of shot-gun methods we have used.

Nevertheless, the present study of scientific achievement in our group of 800 men, despite its many inadequacies, has yielded valuable clues to many characteristic differences between scientists and nonscientists, and also to differences between groups of scientists. Especially significant for the purpose of counseling and guidance are the differences observable in childhood behavior, interests, and preoccupations that are found many years later to discriminate between scientists and nonscientists. The results we have obtained by Strong's vocational interest test argue strongly for the value of this test in vocational guidance, especially if later research confirms Strong's data on the relative permanence of an individual's interest patterns after the age of high school graduation. The group differences we have found on this test, given at the average age of 30 years, are all the more significant in view of the fact that very few of our men had been exposed to vocational counseling either in high school or college.

It is disappointing, however, that so many of the variables provided by the blank on Supplementary Biographical Data failed to yield significant group differences. It had been hoped that the ratings on parents and on parent-child relationships, together with other questions in the blank calling for information on factors influencing life achievement, might throw much-needed light on motivational factors. A few of these items proved to be discriminating but not enough of them to document what we believe to be the decisive role motivation has played in shaping the lives of these men. A new approach to this problem should be made when the next fol-

low-up of the group is undertaken.

In closing we wish to call attention to a fact not primarily related to the purpose of this study; namely, the frequency of superior achievement in this group of 800 men, selected in childhood solely on the basis of high IQ, in comparison with what could have been expected of a group of 800 boys of corresponding age picked at random in the school population. The number who became research scientists, engineers, physicians, lawyers, or college teachers, or who were highly successful in business and other fields, is in each case many times the number a random group would have provided. But for the fact that a majority of our group reached college age shortly before or shortly after the beginning of the great depression, which prevented many from getting as much schooling as they would have obtained in normal times, the general level of achievement would have

been even higher than it was.

Another fact that is of interest, though not germane to the purpose of the present study, is that the intellectual ability of the group, as measured by the Concept Mastery test, increased in the twelve-year period between 1939-40 and 1951-52. Form A of the test was given when the average age of the subjects was about 29 years, and Form B when the average was about 41. After the two forms of the test were equated for difficulty by administering them both to new populations (half in the AB and half in the BA order), Bayley and Oden (2) analyzed the score changes of 772 gifted subjects who had taken both the earlier and the later test and found that the great majority of changes were in the upward direction. The average gain was statistically significant for both sexes, and for the older as well as for the younger subjects.

REFERENCES

1. BARNETT, G. J., STEWART, L. H., & SUPER, D. E. Level of occupational interest: dead-weight or dynamism? *Educ. psychol. Measmt.*, 1953, **13**, 193-208.
2. BAYLEY, NANCY, & ODEN, MELITA H. Maintenance of intellectual ability in gifted adults. (To be published.)
3. BUKES, BARBARA S., JENSEN, DOROTHY W., & TERMAN, L. M. *The promise of youth; follow-up studies of a thousand gifted children. Genetic studies of genius*. Vol. III. Terman, L. M. (Ed.). Stanford, California: Stanford Univer. Press, 1930.
4. ROE, ANNE. *The making of a scientist*. New York: Dodd, Mead, 1953.
5. STRONG, E. K., JR. Interest scores while in college of occupations engaged in 20 years later. *Educ. psychol. Measmt.*, 1951, **11**, 335-348.
6. STRONG, E. K., JR. Nineteen-year follow-up of engineer interests. *J. appl. Psychol.*, 1952, **36**, 65-74.
7. STRONG, E. K., JR. *Vocational interests of men and women*. Stanford, California: Stanford Univer. Press, 1943.
8. STRONG, E. K., JR. Vocational interests of accountants. *J. appl. Psychol.*, 1949, **33**, 474-481.
9. TERMAN, L. M. *et al. Mental and physical traits of a thousand gifted children. Genetic studies of genius*. Vol. I. Terman, L. M. (Ed.). Stanford, California: Stanford Univer. Press, 1925.
10. TERMAN, L. M., ODEN, MELITA H., *et al. The gifted child grows up: twenty-five years follow-up of a superior group. Genetic studies of genius*. Vol. IV. Terman, L. M. (Ed.). Stanford, California: Stanford Univer. Press, 1947.
11. TERMAN, L. M., & MILES, CATHARINE. *Sex and personality*. New York: McGraw-Hill, 1936.

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APPENDIX

List of items that did not yield significant differences
(Starred items have been discussed in the article)

Year of birth	Number of maternal uncles in professional occupations: parent's report, 1922
Intelligence test score, 1922	One or more sibs rated less bright than subject: parent's report, 1922
Age when tested for gifted study	Birth order of subject: parent's report, 1922
Father's age at birth of subject: parent's report, 1922	Mother's health during pregnancy: parent's report, 1922
Mother's age at birth of subject: parent's report, 1922	Exceptional conditions of birth: parent's report, 1922
Social, civic, or political interests and hobbies of father: parent's report, 1922	Age at learning to walk: parent's report, 1922
Intellectual interests and hobbies of father: parent's report, 1922	Age at learning to talk: parent's report, 1922
Artistic interests and hobbies of father: parent's report, 1922	Weight-height-age index: anthropometric measurements, 1922
Creative interests and hobbies of father: parent's report, 1922	Deviation in height from age norm: anthropometric measurements, 1922
*Religious interests and hobbies of father: parent's report, 1922	Deviation in strength of grip from age norm: anthropometric measurements, 1922
*Mother's schooling A.B. or higher: parent's report, 1922	Deviation in width of shoulders from age norm: anthropometric measurements, 1922
Social, civic, or political interests and hobbies of mother: parent's report, 1922	Deviation in lung capacity from age norm: anthropometric measurements, 1922
Intellectual interests and hobbies of mother: parent's report, 1922	Home rating on Whittier Scale: field worker, 1922
Artistic interests and hobbies of mother: parent's report, 1922	Number of books in home library: parent's report, 1922
Creative interests and hobbies of mother: parent's report, 1922	Amount of home instruction: parent's report, 1922
Religious interests and hobbies of mother: parent's report, 1922	Amount of reading: parent and teacher rating, 1922
Outdoor interests and hobbies of mother: parent's report, 1922	Number of books read in two-month period: subject's reading record, 1922
Social, civic, or political positions of honor of father: parent's report, 1922	Interest in dictionaries, atlases, and encyclopedias: parent's report, 1922
Professional positions of honor of father: parent's report, 1922	Number of collections made by subject: parent's report, 1922
Positions of honor of mother—number of: parent's report, 1922	Imaginary playmates or countries: parent's report, 1922
Social, civic, or political positions of honor of mother: parent's report, 1922	Ability in mathematics above average: parent's report, 1922
Religious positions of honor of mother: parent's report, 1922	Ability in art above average: parent's report, 1922
Occupation of paternal grandfather: parent's report, 1922	*Ability in music above average: parent's report, 1922
Occupation of maternal grandfather: parent's report, 1922	Preference for indoor play: parent's report, 1922
Schooling of paternal grandfather: parent's report, 1922	Amount of play information: plays and games test, 1922
Schooling of maternal grandfather: parent's report, 1922	Masculinity ratings: plays and games test, 1922
Schooling of paternal grandmother: parent's report, 1922	Overstatement tendencies: character and personality tests, 1922
Schooling of maternal grandmother: parent's report, 1922	Trustworthiness: character and personality tests, 1922
Number of paternal uncles in professional occupations: parent's report, 1922	Social attitudes: character and personality tests, 1922
	Woodworth-Cady Inventory: character and personality tests, 1922

- Character Test total score, 1922
- Intellectual Interests: Wyman interest test, 1922
- Social Interests: Wyman interest test, 1922
- Activity Interests: Wyman interest test, 1922
- Ratings on 4 intellectual traits by parent and teacher, 1922
- Ratings on 3 emotional traits by parent and teacher, 1922
- Ratings on 2 health traits by parent and teacher, 1922
- Total quotient: school achievement and information tests, 1922
- Reading quotient: school achievement and information tests, 1922
- Arithmetic quotient: school achievement and information tests, 1922
- Language usage quotient: school achievement and information tests, 1922
- Spelling quotient: school achievement and information tests, 1922
- Science quotient: school achievement and information tests, 1922
- History-civics quotient: school achievement and information tests, 1922
- Arts quotient: school achievement and information tests, 1922
- Rating on social adjustment based on report of parent and teacher, 1922
- Rating on nervous symptoms based on report of parent, teacher, and medical examiner, 1922
- Rating on health based on parent's report, 1928
- Frequency of colds: parent's report, 1922 and 1928
- Frequency of headaches: parent's report, 1922 and 1928
- Frequency of digestive trouble: parent's report, 1922 and 1928
- Total number of illnesses or accidents: parent's report, 1922 and 1928
- Serious aftereffects from illnesses or accidents: parent's report, 1922 and 1928
- Age at puberty as indicated by voice change: parent's report, 1922 and 1928
- Subject's liking for school: parent's and teacher's report, 1922 or 1928
- Long absence from school and cause of: parent's and teacher's report, 1922 or 1928
- Desire for college: parent's and field worker's report, 1922 or 1928
- Teased by others: parent's and teacher's report, 1922 or 1928
- Considered queer or different: parent's and teacher's report, 1922 or 1928
- Preferred age of companions at adolescence: subject's report, 1922 or 1928
- Tendencies toward selfishness: parent's and field worker's report, 1928
- Interest in the opposite sex: parent's and field worker's report, 1928
- Rating on social adjustment based on report of parent and teacher, 1928
- Rating on nervous symptoms based on report of parent and teacher, 1928
- Rating on social adjustment by field worker, 1928
- Attitude toward discipline: parent's report, 1928
- Rating on 12 traits: parent's and teacher's report, 1928
- Rating on 4 intellectual traits: parent's and teacher's ratings, 1928
- Rating on 3 emotional traits: parent's and teacher's ratings, 1928
- Rating on 2 volitional traits: parent's and teacher's ratings, 1928
- Rating on 2 moral traits: parent's and teacher's ratings, 1928
- Rating on 4 social traits: parent's and teacher's ratings, 1928
- Age at completing eighth grade
- Age at completing high school
- On honor roll in high school
- Rating on general achievement by field worker, 1928
- Rating on environment by field worker, 1928
- Loss of parent or parents by death or separation before age 20: case history data
- Loss of father before age 20 and subject lived with mother (no father substitute): case history data
- *Number of subject's sibs (living and dead) to 1940: case history data
- Extent of self-support, undergraduate years: subject's report, 1940
- Self-rating on degree of interest in religion: subject's report, 1940
- Self-rating on degree of interest in domestic arts: subject's report, 1940
- Self-rating on degree of interest in pets: subject's report, 1940
- Self-rating on degree of interest in travel: subject's report, 1940
- Self-rating on degree of interest in literature: subject's report, 1940
- Score for Personnel Manager: Strong Vocational Interest Test, 1940
- Score for President of Manufacturing Company: Strong Vocational Interest Test, 1940
- Number of avocational interests: subject's report, (a) 1940 (b) 1950
- Kinds of avocational interests: subject's report, 1940
- *Regularity of voting on national issues: subject's report, 1950
- *Regularity of voting on state issues: subject's report, 1950
- Self-rating on maintenance of mental superiority: subject's report, 1940
- *Height as reported by subject: 1940
- Self-rating on general health: (a) 1940 (b) 1950
- Self-rating on use of liquor: (a) 1940 (b) 1950

Rating on general adjustment and mental health based on case history data: (a) 1940 (b) 1951

Case history data to 1951 relating to marriage:

Marital status and history of divorce to 1951

Number of children to 1951

Age at first marriage

Husband-wife age difference

Amount of wife's schooling

Occupational status of wife

Subject's score on marital aptitude test: 1940

Subject's score on marital happiness test: (a) 1940 (b) 1951

Subject's rating of happiness of his marriage: 1951

Wife's score on marital aptitude test: 1940

Wife's score on marital happiness test: (a) 1940 (b) 1951

Wife's rating of happiness of her marriage: 1951

The following items are from the Supplementary Biographical Data blank which was filled out by the subjects in 1951 (See page 28). Relationships with parents in childhood and youth:

Extent of admiration for father

Extent of rebelliousness toward father

Extent to which father encouraged efforts toward initiative and independence

Extent to which mother encouraged efforts toward initiative and independence

Extent to which father resisted efforts to achieve normal independence

*Extent to which mother resisted efforts to achieve normal independence

Extent of feeling of rejection by father

Extent of feeling of rejection by mother

Extent of affection and understanding between self and mother

Subject's rating of parents on certain traits (to be considered apart from their relationships with their children).

How self-confident: (a) father (b) mother

How helpful: (a) father (b) mother

How domineering: (a) father (b) mother

How friendly: (a) father (b) mother

How intelligent: (a) father (b) mother

Relationships within family in childhood and youth:

Close attachment between subject and any sib or sibs

Marked friction among members of family

Marked friction between parents

Marked friction between subject and parents

Adequacy of finances in home in childhood and youth

Parents' social position as compared with that of schoolmates

Opinion on vocational success of father during childhood and youth

Amount of religious training in childhood and youth

Extent to which religiously inclined as an adult

Religious affiliation as an adult

Rating on general level of health: (a) in childhood (b) in adolescence

Opinion as to effects of size, appearance, strength, agility, or physical handicaps on personality

Rating on amount of physical energy in recent years

Major problems or difficulties related to sex, either in childhood or later

Extent of interest in succeeding at being a leader: (a) age 12-20 (b) since age 20

Extent of interest in succeeding at having friends: (a) age 12-20 (b) since age 20

Extent of interest in succeeding at making money: (a) age 12-20 (b) since age 20

Extent of interest in being a social success: since age 20

Extent of interest in succeeding at school work: (a) age 12-20 (b) since age 20

Parents' attitude toward progress in school

Parents' attitude toward quality of school marks

Parents' attitude toward college attendance

Opinion of subject on factors which have contributed to life accomplishment to date:

Superior mental ability

Persistence in working toward goal

Good habits of work

Excellent health

Good mental stability

Helpful factors related to other people

Opinion of subject on factors which have hindered life accomplishment to date:

Inadequate mental ability

Inadequate education

Poor social adjustment

Mental instability

Poor personality

Lack of persistence in working toward a goal

Poor work habits

Poor health

Hindering factors related to other people

Opinion of subject on aspects of life giving greatest satisfaction:

Recognition for accomplishments

Avocational activities or hobbies

Marriage

Children

Social contacts

Community service activities

Self-ratings on traits of personality as an adult:

Happiness of temperament

Moodiness

Impulsiveness

Self-confidence

Emotionality

How easy to get on with

Enjoyment of social contacts

Persistence in accomplishment of ends

Integration toward goal

Sensitivity of feelings

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